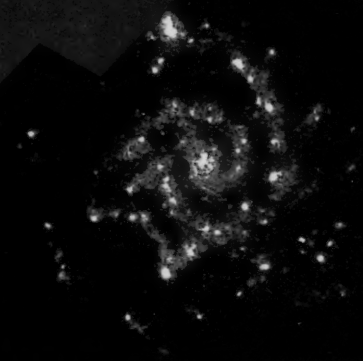
Scientific and Technical Aerospace Reports



An Abstract Journal

Volume 32, Number 10
October 1994
N94-33357 to N94-35225

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N.A.—No abstracts were assigned to this category for this issue.

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TYPICAL CITATION AND ABSTRACT

NASA SPONSORED — ON MICROFICHE

ACCESSION NUMBER → **N94-12270*#** United Technologies Corp., West Palm Beach, FL. ← CORPORATE SOURCE
Pratt and Whitney.

TITLE → **ADVANCED CONTROL FOR AIRBREATHING ENGINES, VOLUME 1: PRATT AND WHITNEY**

AUTHOR → J. A. Ralph Jul. 1993 83 p ← PUBLICATION DATE

CONTRACT OR GRANT → (Contract NAS3-25952; RTOP 505-62-61)

REPORT NUMBERS → (NASA-CR-189203; E-8006; NAS 1.26:189203) Avail: CASI HC A05/MF A01 ← AVAILABILITY SOURCE AND PRICE CODE

The application of advanced control concepts to air breathing engines may yield significant improvements in aircraft/engine performance and operability. Screening studies of advanced control concepts for air breathing engines were conducted by three major domestic aircraft engine manufacturers to determine the potential impact of concepts on turbine engine performance and operability. The purpose of the studies was to identify concepts which offered high potential yet may incur high research and development risk. A target suite of proposed advanced control concepts was formulated and evaluated in a two phase study to quantify each concept's impact on desired engine characteristics. To aid in the evaluation specific aircraft/engine combinations were considered: a Military High Performance Fighter mission, a High Speed Civil Transport mission, and a Civil Tiltrotor mission. Each of the advanced control concepts considered in the study are defined and described. The concept potential impact on engine performance was determined. Relevant figures of merit on which to evaluate the concepts are determined. Finally, the concepts are ranked with respect to the target aircraft/engine missions. A final report describing the screening studies was prepared by each engine manufacturer. Volume 1 of these reports describes the studies performed by Pratt & Whitney. Author (revised)

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Scientific and Technical Aerospace Reports

A Monthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N94-33572* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NACA FIRE CRASH RESEARCH (Videotape)
1992 Videotape: 39 min. playing time, in color, with sound
(NASA-TM-109794; NONP-VT-94-12922) Avail: CASI VHS A01/BETA A22

This video provides a better understanding of the important factors involved in the start and spread of crash fires, as a necessary first step leading to significant reduction in the crash fire hazards. CASI

N94-33590 Knowledge Systems, Inc., Atlanta, GA.
COMPOSITE REPAIRS OF CRACKED METALLIC AIRFRAME STRUCTURES Final Report
S. N. Atluri, J. H. Park, E. F. Punch, P. E. ODonoghue, and Rhys Jones
May 1993 188 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DTRS57-89-C-0008)
(AD-A277680; DOT/FAA/CT-92/32) Avail: CASI HC A09

This report summarizes work that quantifies the benefits of composite patch repairs on cracked metallic aircraft structures. The first chapter describes a data base on bonding methods and repair materials that can be used in design and analysis. In the second chapter, analytical models are derived for the stress intensity factor of cracks in metallic sheets with bonded orthotropic repairs. Specific configurations included through-the-thickness center cracks, through-the-thickness cracks at a loaded fastener hole, surface cracks, and surface cracks at a hole. These analyses can be used in calculations of crack growth life extension resulting from the bonded repairs. Four types of specimens were tested in fatigue to verify the increase in fatigue life. The four configurations were edge crack specimens, surface specimens with multiple site damage (MSD). DTIC

N94-33942*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
A DIRECT APPLICATION OF THE NON-LINEAR INVERSE TRANSFORMATION FLIGHT CONTROL SYSTEM DESIGN ON A STOVL AIRCRAFT
W. W. Chung, W. E. McNeill, and M. W. Stortz May 1993 28 p
(RTOP 533-02-37)
(NASA-TM-108808; A-94044; NAS 1.15:108808) Avail: CASI HC A03/MF A01

The nonlinear inverse transformation flight control system design method is applied to the Lockheed Ft. Worth Company's E-7D short takeoff and vertical land (STOVL) supersonic fighter/attack aircraft design with a modified General Electric F110 engine which has augmented propulsive lift capability. The system is fully augmented to provide flight path control and velocity control, and rate command attitude hold for angular axes during the transition and hover operations. In cruise mode, the flight control system is configured to provide direct thrust command, rate command attitude hold for pitch and roll axes, and sideslip command with turn coordination. A control selector based on the nonlinear inverse transformation method is designed specifically to be compatible with the propulsion system's physical configuration which has a two dimensional convergent-divergent aft nozzle, a vectorable ventral nozzle, and a thrust augmented ejector. The nonlinear inverse transformation is used to determine the propulsive forces and nozzle deflections, which in combination with the aerodynamic forces and moments (including propulsive induced contributions), and gravitational force, are required to achieve the longitudinal and vertical acceleration commands. The longitudinal control axes are fully decoupled within the propulsion system's performance envelope. A piloted motion-base flight simulation was conducted on the Vertical Motion Simulator (VMS) at NASA Ames Research Center to examine the handling qualities of this design. Based on results of the simulation, refinements to the control system have been made and will also be covered in the report. Author (revised)

N94-34688* National Aeronautics and Space Administration, Washington, DC.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 305)
Jun. 1994 95 p
(NASA-SP-7037(305); NAS 1.21:7037(305)) Avail: CASI HC A05

This bibliography lists 239 reports, articles, and other documents recently introduced into the NASA scientific and technical information system. Subject coverage includes the following: the design, construction, and testing of aircraft and aircraft engines; aircraft components, equipment, and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics. Author (revised)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N94-33382 Colorado Univ., Boulder, CO.
SIMILARITY IN SEPARATED FLOW FIELDS PRODUCING LARGE-SCALE VORTICES Ph.D. Thesis
Eric Joe Stephen 1992 163 p
Avail: Univ. Microfilms Order No. DA9318136

Over the last few decades dynamic stall has been the subject of numerous investigations. The increased transient lift produced by unsteady separated flows suggested the potential for enhanced aerodynamic performance. Ultimately a thorough understanding of these flows will lead to important advancements in the design of highly maneuverable aircraft. Recently McLaughlin, in distilling the data from a wide range of dynamic stall cases, demonstrated that the maximum lift is produced coincident with leading edge vortex production. Understanding vortex development is crucial to the exploitation of unsteady aerodynamics. In order to investigate the genesis of large sale vortex development, a few representative flow conditions were selected for analysis: flow over a cylinder, flow over a pitching airfoil, flow over an autorotating plate, and flow over a delta wing. From collected pressure and wake data, a vortex model was developed that predicts the unsteady vortex behavior across all of these test conditions. In many instances new experimental data were collected to provide sufficient information for model development. In the process of the experiments, a new technique of acquiring pressure data on a rotating body was developed. Also the presence of nonzero stable roll positions for a static delta wing were reported. The pressure data suggest that the vorticity distribution, magnitude, and location can be estimated from the vorticity diffusion rates scaled to the pressure gradients. The characteristic scale of the wake, bounding the accumulated vorticity, provides an estimate of the diameter

of large scale vortices. Through a combination of these parameters, a predictive model could be derived for vortex shedding, initiation, and convection. These simple vortex models lead to predictive algorithms for unsteady flow structures. The temporal limits, provided by the model, agree with having temporal characteristics of unsteady vortical flow derived by McLaughlin from all existing empirical data. Since both the analytical and empirical models provide simple linear prediction of unsteady flow behavior, the task of incorporating unsteady aerodynamic designs in new generation aircraft may be simplified. Dissert. Abstr.

N94-33447*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

FIRST ANNUAL HIGH-SPEED RESEARCH WORKSHOP, PART 1

Allen H. Whitehead, Jr., comp. Apr. 1992 482 p Workshop held in Williamsburg, VA, 14-16 May 1991; sponsored by NASA, Washington

(RTOP 537-01-22-01)

(NASA-CP-10087-Pt-1; NAS 1.55:10087-Pt-1) Avail: CASI HC A21/MF A04

The workshop was presented to provide a national forum for the government, industry, and university participants in the program to present and discuss important technology issues related to the development of a commercially viable, environmentally compatible U.S. High Speed Civil Transport. The workshop sessions were organized around the major task elements in NASA's Phase 1 High Speed Research Program which basically addressed the environmental issues of atmospheric emissions, community noise, and sonic boom. This volume is divided into three sessions entitled: Plenary Session (which gives overviews from NASA, Boeing, Douglas, GE, and Pratt & Whitney on the HSCT program); Airframe Systems Studies; and Atmospheric Effects. For individual titles, see X92-10721 through X92-10734. For individual titles, see N94-33448 through N94-33461.

N94-33448*# National Aeronautics and Space Administration, Washington, DC.

FIRST ANNUAL HSR PROGRAM WORKSHOP: HEADQUARTERS PERSPECTIVE **c05**

Robert E. Anderson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 5-23 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

The presentation is made up of viewgraphs. The national challenge is presented along with the program genesis and structure. The objectives of the workshop are also given. The national challenge is to develop and take advantage of the growing market for long distance air travel. The High Speed Civil Transport (HSCT) represents the next plateau in an aggressive international aviation competition. The workshop is to review and discuss future effort and plans in HSR. CASI

N94-33449*# Boeing Commercial Airplane Co., Seattle, WA.

NASA ANNUAL HSR WORKSHOP: BOEING HSCT PROGRAM SUMMARY **c05**

Michael L. Henderson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 27-92 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

Boeing's view of the High Speed Civil Transport (HSCT) is given in viewgraph format. Boeing believes that the forecast for long range scheduled international traffic is sufficiently large in the post year 2005 time period to support a fleet of HSCT's. Technologies are projected to be available to create an HSCT that will have the required performance and operating economics, and which can be sold at a price that will provide a reasonable return to Boeing and the airlines. With relatively modest surcharges over competing subsonic fares, it is expected that an HSCT providing roughly a 50 percent time savings would capture a significant market share. CASI

N94-33450*# Douglas Aircraft Co., Inc., Saint Louis, MO. Advanced Commercial Programs.

UPDATE ON DOUGLAS' HIGH-SPEED CIVIL TRANSPORT STUDIES **c05**

Bruce L. Bunin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 95-133 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

A summary is presented of high speed civil transport (HSCT) studies underway at Douglas Aircraft. A brief review is given of experience with design and development of advanced supersonic transport concepts and associated technology. A review is then presented of past NASA funded contract research studies focused on selection of appropriate concepts for high speed civil transport aircraft to be introduced in the year 2000 time frame for commercial service. Follow-on activities to those studies are then presented which were conducted under independent research studies as well as under further NASA funded efforts. Design Mach number selections and associated baseline design missions are then discussed along with forecasted passenger traffic and associated supersonic fleet sizes, and then proceeds into a discussion of individual issues related either to environmental acceptability or overall technology requirements in order to achieve the required economic viability of the program. A summary is given of current and future plans and activities. Derived from text

N94-33451*# General Electric Co., Cincinnati, OH. Aircraft Engines.

GENERAL ELECTRIC/PRATT AND WHITNEY SUMMARY REPORT **c07**

Samuel C. Gilkey and Richard W. Hines *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 137-195 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

The views of GE and P&W on the High Speed Civil Transport (HSCT) are presented in viewgraph format. The technology developments needed to address the environmental issues of airport noise and engine emissions represent the threshold level for a viable program. These technologies must be introduced in concert with the propulsion system materials technologies and other aircraft technologies to reduce both the cost of ownership and the direct operating cost of the HSCT. They are key to the environmental compatibility and economic viability of a HSCT for entry into service in the year 2005. CASI

N94-33452*# National Aeronautics and Space Administration, Washington, DC.

HEADQUARTERS SUMMARY REPORTS **c05**

In NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 199-299 (For primary document see N94-33447 10-02)

Avail: CASI HC A05/MF A04

The status is summarized of the NASA sponsored involvement in high speed civil transport research and technology, including major cooperative efforts. That involvement is currently focussed on the High Speed Research Program. The program goals are an acceptable level of ozone depletion or sonic boom, the definition of which is a regulatory and political process. The HSRP goal is to provide technical bases for acceptability criteria. Community noise is currently regulated, and it seems clear that HSCT aircraft will have to comply with at least the spirit of the current subsonic constraint, FAR 36, Stage 3. CASI

N94-33453*# Boeing Commercial Airplane Co., Seattle, WA.

AIRFRAME SYSTEMS STUDIES REVIEW **c05**

Frank D. Neumann *In* NASA. Langley Research Center, Forst Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 305-357 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

The High Speed Civil Transport (HSCT) mission perspective is given, along with the systems studies goals, a configuration for the commercially viable HSCT, and a summary of the HSCT airframe systems studies during phases 1, 2, and 3. The environment effect goals are also presented, along with the airplane size projections, low sonic boom technology, and conclusions. CASI

N94-33454*# Douglas Aircraft Co., Inc., Saint Louis, MO.

DOUGLAS AIRCRAFT HSCT STATUS AND FUTURE RESEARCH NEEDS **c05**

H. Robert Welge *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 361-384 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

Current activities on the High Speed Civil Transport (HSCT) at Douglas are focussed on baseline vehicle development at Mach 1.6 and 2.4. Parallel design activities incorporating the latest technologies in structures/materials,

propulsion/noise, and aerodynamics are also being conducted and incorporated into the baseline to establish performance, economic viability, and environmental compliance. Studies are also being conducted to establish the feasibility of incorporating laminar flow control and minimized sonic boom concepts into the baseline. A decision point on these last two technologies is targeted prior to the start of the NASA HSR Phase 2 Program in 1993. Derived from text

N94-33455*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

HIGH-SPEED RESEARCH PROGRAM SYSTEMS ANALYSIS ACTIVITIES AT AMES RESEARCH CENTER **c05**

George H. Kidwell *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 387-419 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

The Ames Systems Analysis Branch has been working to support the High Speed Research Program (HSRP) for nearly one year. Both the status of methodology development activities and the results of studies are presented whether completed or underway. The discussion involves the conceptual design synthesis program used for High Speed Civil Transport (HSCT) studies, ACSYNT (aircraft synthesis), and enhancements that have been made especially for HSRP. Some results are presented for one study that has been completed and two that are underway. These are the advanced controls integration study, the fuel cost impact study, and the oblique wing configuration evaluation that is part of a larger innovative concepts study. Derived from text

N94-33456*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

OVERVIEW OF LANGLEY SYSTEMS STUDIES **c05**

Samuel D. Dollyhigh *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 423-455 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

Late in 1990, the NASA Systems Integration Group began functioning and the aircraft systems studies entered a second phase. This group proposed tightly coordinated Ames/Langley/Lewis/industry studies that would address a series of tasks to evaluate progress, recommend appropriate direction, and emphasize changes in technology elements based on system level payoffs and potential success assessments. Based on technical and economic assessment studies of the High Speed Civil Transport (HSCT) to date, Mach 2.4 was chosen as the primary focus for the High Speed Research Program with Mach numbers 2.0 and 1.6 being backups in case of technology shortfalls. Langley has established an interdisciplinary tnam to strengthen the multidisciplinary aspects of aircraft design and analysis. The vehicle focus of this team is the HSCT. At Langley, early HSCT studies focused on turbojet powered aircraft. They also concluded that variable sweep wing concepts require 50/50 subsonic/supersonic to payoff for Mach 3.0 concept. Progress has been good in low sonic boom concepts. CASI

N94-33457*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

STRATOSPHERIC MODELS AND MEASUREMENTS: A CRITICAL COMPARISON **c46**

Ellis E. Remsberg *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 461-463 (For primary document see N94-33447 10-02)

Avail: CASI HC A01/MF A04

The stated objectives of the High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft (AESA) initiative are to support research in the atmospheric sciences that will improve the basic understanding of the circulation and chemistry of the stratosphere and lead to interim assessments of the impact of a projected fleet of HSCT's on the stratosphere. Three model comparison workshops have been conducted, so far, in support of this goal. These workshops have been focused on the differences between models used to calculate the atmospheric effects of the proposed aircraft emissions. It is now possible to test these models against atmospheric data. Derived from text

N94-33458*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

PREVIOUS MODEL COMPARISONS Abstract Only **c05**

Charles H. Jackman *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 467-468 (For primary document see N94-33447 10-02)

Avail: CASI HC A01/MF A04

The first model comparison workshop examined 14 mathematical models. Issues discussed included: transport methodologies; transport of nuclear test debris; transport algorithms; source gases; NO(y), Cl(x), HO(x), and O3; photolysis rates; diurnal averaging; and rainout. The second model comparison meeting examined 16 models. More real model-model intercomparisons were undertaken and several topics were addressed including: photochemistry and radiation; transport; current atmosphere 1980; and assessment runs. The models computed different values for photolysis rates even when O3 and O2 were fixed, thus more time should be spent at future model comparison meeting on radiation codes.

Derived from text

N94-33459*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

MODEL CAPABILITIES, 2-D **c46**

Charles H. Jackman *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 473-475 (For primary document see N94-33447 10-02)

Avail: CASI HC A01/MF A04

Two dimensional (2-D) atmospheric models provide results for altitude versus latitude as a function of time and are developed primarily for two reasons: to help understand atmospheric occurrences and to give assessments and/or make predictions of future changes in the atmosphere. Historically, the formulation of transport in 2-D models has been a difficult problem. Most current 2-D models have a transport that is either an Eulerian mean circulation with large stratospheric eddy diffusion or a residual (diabatic or Lagragian) mean circulation which typically is accompanied with small stratospheric eddy diffusion. Because of the assumption of zonal averaging, 2-D models are primarily useful in making predictions of atmospheric changes of time scales longer than a season. Although decadel atmospheric changes may be reasonably well represented with a 2-D model, the year to year changes which result from interannual transport differences, stratospheric warmings, semiannual oscillations, or quasi-biennial oscillations may not be well represented in the stratosphere and troposphere. Derived from text

N94-33460*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

COMPARISON OF THE IMPACT OF VOLCANIC ERUPTIONS AND AIRCRAFT EMISSIONS ON THE AEROSOL MASS LOADING AND SULFUR BUDGET IN THE STRATOSPHERE **c45**

Glenn K. Yue and Lamont R. Poole *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 481-495 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

Data obtained by the Stratospheric Aerosol and Gas Experiment (SAGE) 1 and 2 were used to study the temporal variation of aerosol optical properties and to assess the mass loading of stratospheric aerosols from the eruption of volcanos Ruiz and Kelut. It was found that the yearly global average of optical depth at 1.0 micron for stratospheric background aerosols in 1979 was 1.16 x 10(exp -3) and in 1989 was 1.66 x 10(exp -3). The eruptions of volcanos Ruiz and Kelut ejected at least 5.6 x 10(exp 5) and 1.8 x 10(exp 5) tons of materials into the stratosphere, respectively. The amount of sulfur emitted per year from the projected subsonic and supersonic fleet is comparable to that contained in the background aerosol particles in midlatitudes from 35 deg N to 55 deg N.

Author (revised)

N94-33461*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

HIGH RESOLUTION INFRARED DATASETS USEFUL FOR VALIDATING STRATOSPHERIC MODELS **c46**

Curtis P. Rinsland *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 499-504 (For primary document see N94-33447 10-02)

Avail: CASI HC A02/MF A04

An important objective of the High Speed Research Program (HSRP) is to support research in the atmospheric sciences that will improve the basic understanding of the circulation and chemistry of the stratosphere and lead to an interim assessment of the impact of a projected fleet of High Speed Civil Transports (HSCT's) on the stratosphere. As part of this work, critical comparisons between models and existing high quality measurements are planned. These comparisons will be used to test the reliability of current atmospheric chemistry models. Two suitable sets of high resolution infrared measurements are discussed. Derived from text

N94-33462*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

FIRST ANNUAL HIGH-SPEED RESEARCH WORKSHOP, PART 2

Allen H. Whitehead, Jr., comp. Apr. 1992 521 p Workshop held in Williamsburg, VA, 14-16 May 1991; sponsored by NASA, Washington (RTOP 537-01-22-01)

(NASA-CP-10087-Pt-2; NAS 1.55:10087-Pt-2) Avail: CASI HC A22/MF A04

This workshop provided a national forum for presenting and discussing important technology issues related to the definition of an economically viable and environmentally compatible High Speed Civil Transport. The workshop was organized into 13 sessions. This volume is part 2 of 4 and covers 4 of the 13 sessions: (1) source noise; (2) sonic boom (aerodynamic performance); (3) propulsion systems studies; and (4) emission reduction. For individual titles, see N94-33463 through N94-33486.

N94-33463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

NASA HSR PHASE 1 LOW NOISE NOZZLE TECHNOLOGY PROGRAM OVERVIEW **c07**

Bernard J. Blaha *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 509-515 (For primary document see N94-33462 10-02)

Avail: CASI HC A02/MF A04

The topics covered include the following: supersonic cruise, the High Speed Research (HSR) Program, the High Speed Civil Transport (HSCT) noise challenge, low-noise nozzle technology elements, the HSR Source Noise Reduction Program, and NASA HSR plan propulsion elements. Author

N94-33464*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

HIGH SPEED JET NOISE RESEARCH AT NASA LEWIS **c71**

Eugene A. Krejsa, B. A. Cooper, C. M. Kim, and Abbas Khavaran *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 519-532 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The source noise portion of the High Speed Research Program at NASA LeRC is focused on jet noise reduction. A number of jet noise reduction concepts are being investigated. These include two concepts, the Pratt & Whitney ejector suppressor nozzle and the General Electric (GE) 2D-CD mixer ejector nozzle, that rely on ejectors to entrain significant amounts of ambient air to mix with the engine exhaust to reduce the final exhaust velocity. Another concept, the GE 'Flade Nozzle' uses fan bypass air at takeoff to reduce the mixed exhaust velocity and to create a fluid shield around a mixer suppressor. Additional concepts are being investigated at Georgia Tech Research Institute and at NASA LeRC. These will be discussed in more detail in later figures. Analytical methods for jet noise prediction are also being developed. Efforts in this area include upgrades to the GE MGB jet mixing noise prediction procedure, evaluation of shock noise prediction procedures, and efforts to predict jet noise directly from the unsteady Navier-Stokes equation. Author

N94-33465*# Pratt and Whitney Aircraft, East Hartford, CT.

HSCT NOZZLE SOURCE NOISE PROGRAMS AT PRATT AND WHITNEY **c71**

Alfred M. Stern *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 535-549 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The topics covered include the following: 20 dB jet noise suppression; ejector nozzle technology program - noise reduction vs. flow augmentation; mixer ejector nozzle technology challenges; 1989 High Speed Civil Transport (HSCT) 2-D ejector model test in NASA's 9 x 15 ft. tunnel; tertiary airflow 1989 2-D ejector test; shock noise dominates 2-D ejector test; lessons learned - 2-D mixer/ejector in 9 x 15 ft. tunnel; 1990 HSCT axisymmetric ejector model test in Boeing's Low Speed Aeroacoustic Facility (LSAF); axisymmetric mixer/ejector mach contours - peak and valley - NASTAR pre-test predictions; tertiary airflow objectives accomplished - 1990 AXI model; and HSCT low noise exhaust technology programs. Author

N94-33466*# General Electric Co., Cincinnati, OH. Aircraft Engines.

HSCT NOISE REDUCTION TECHNOLOGY DEVELOPMENT AT GE AIRCRAFT ENGINES **c71**

Rudramuni K. Majjigi *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 553-589 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The topics covered include the following: High Speed Civil Transport (HSCT) exhaust nozzle design approaches; GE aircraft engine (GEAE) HSCT acoustics research; 2DCD non-IVP suppressor ejector; key sensitivities from reference aircraft; acoustic experiments; aero-mixing experimental set-up; fluid shield nozzle; HSCT Mach 2.4 flade nozzle; noise prediction; nozzle concept for GE/Boeing joint test; scale model hot core flow path modified to prevent hub-choking CFL3-D solution; HSCT exhaust nozzle status; and key acoustic technology issues for HSCT's. Author

N94-33467*# Boeing Commercial Airplane Co., Seattle, WA.

COMMUNITY NOISE SOURCES AND NOISE CONTROL ISSUES **c71**

Gene L. Nihart *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 593-606 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The topics covered include the following: community noise sources and noise control issues; noise components for turbine bypass turbojet engine (TBE) turbojet; engine cycle selection and noise; nozzle development schedule; NACA nozzle design; NACA nozzle test results; nearly fully mixed (NFM) nozzle design; noise versus aspiration rate; peak noise test results; nozzle test in the Low Speed Aeroacoustic Facility (LSAF); and Schlieren pictures of NACA nozzle. Author

N94-33468*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/LaRC JET PLUME RESEARCH **c07**

John M. Seiner, Michael K. Ponton, and James C. Manning *In its* First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 609-644 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The following provides a summary for research being conducted by NASA/LaRC and its contractors and grantees to develop jet engine noise suppression technology under the NASA High Speed Research (HSR) program for the High Speed Civil Transport (HSCT). The objective of this effort is to explore new innovative concepts for reducing noise to Federally mandated guidelines with minimum compromise on engine performance both in take-off and cruise. The research program is divided into four major technical areas: (1) jet noise research on advanced nozzles; (2) plume prediction and validation; (3) passive and active control; and (4) methodology for noise prediction. Author

N94-33469*# Florida State Univ., Tallahassee, FL. Dept. of Mathematics.

THEORETICAL ASPECTS OF SUPERSONIC JET NOISE **c71**

Christopher K. W. Tam *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 647-662 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

The topics covered include the following: the three components of supersonic jet noise; shock cell structure of imperfectly expanded jets; large turbulence structures/instability waves; supersonic jet noise theory; generation of turbulent mixing noise; comparisons between predicted peak noise frequency and direction of radiation with measurements; Strouhal number of maximum SPL of hot supersonic jets; near field sound pressure

level contours; generation of broadband shock associated noise; calculated and measured far field shock noise spectra; generation of screech tones; and calculated and measured Strouhal number of screech tones. Author

N94-33470*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
DESIGN AND ANALYSIS OF LOW BOOM CONCEPTS AT LANGLEY RESEARCH CENTER **c71**
Christine M. Darden, Robert J. Mack, Kathy E. Needleman, Daniel G. Baize, Peter G. Coen, Raymond L. Barger, N. Duane Melson, Mary S. Adams, Elwood W. Shields, and Marvin E. McGraw *In its* First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 675-699 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The objective of the sonic boom research in the current High Speed Research Program is to ultimately make possible overland supersonic flight by a high speed civil transport. To accomplish this objective, it is felt that results in four areas must demonstrate that such a vehicle would be acceptable by the general public, by the airframers, and by the airlines. It should be demonstrated: (1) that some waveform shape has the possibility of being acceptable to the general public; (2) that the atmosphere would not totally destroy such a waveform during propagation; (3) that a viable airplane could be built which produces such a waveform; and (4) that any performance penalty suffered by a low boom aircraft would be counteracted by the economic benefit of overland supersonic flight. The work being done at LaRC is in support of the third element listed above--the area of configuration design. The initial part of the paper will give a review of the theory being used for configuration designs and discuss two theory validation models which were built and tested within the past two years. Discussion of the wind tunnel and theoretical results (linear theory and higher order methods) and their implications for future designs will be included. Author

N94-33471*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT DESIGN FOR REDUCED SONIC BOOM **c05**
George T. Haglund *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 703-719 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: low sonic boom design perspective; design approach for reduced sonic boom; target sonic boom waveforms; airplane design for reduced sonic boom loudness; design procedure for low sonic boom; wing design and nacelle lift effects; area distributions and F-functions due to volume; fuselage area distributions; low sonic boom design, configuration 3B; sonic boom characteristics; sizing, performance, and noise characteristics; a summary of phase 3 configurations; impact of sonic boom design constraints; and wing loading considerations. Author

N94-33472*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SONIC BOOM PREDICTION AND MINIMIZATION USING COMPUTATIONAL FLUID DYNAMICS **c71**
Thomas A. Edwards, Raymond Hicks, Samson Cheung, Susan Cliff-Hovey, Mike Madson, and Joel Mendoza *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 723-738 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

This paper describes the NASA ARC program in sonic boom prediction methodologies. This activity supports NASA's High Speed Research Program (HSRP). An overview of the program, recent results, conclusions, and current effort will be given. This effort complements research in sonic boom acceptability and validation being conducted at LaRC and ARC. The goals of the sonic boom element are as follows: to establish a predictive capability for sonic booms generated by High-Speed Civil Transport (HSCT) concepts; to establish guidelines of acceptability for supersonic overland flight; and to validate these findings with wind tunnel and flight tests. The cumulative result of these efforts will be an assessment of economic viability for supersonic transportation. This determination will ultimately be made by the aerospace industry. Author

N94-33473*# Douglas Aircraft Co., Inc., Saint Louis, MO.
SONIC BOOM CONFIGURATION MINIMIZATION **c05**
Robert A. Sohn *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 741-756 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: the sonic boom 'big picture'; current low boom technology; Mach number impact on gross weight; equal loudness equivalent areas; performance and sizing results; potential configuration modifications; equivalent area matching; and impact of nose bluntness on aerodynamic characteristics. Author

N94-33474*# Grumman Aerospace Corp., Bethpage, NY.
SONIC BOOM PREDICTIONS USING A MODIFIED EULER CODE **c71**
Michael J. Siclari *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 759-784 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The environmental impact of a next generation fleet of high-speed civil transports (HSCT) is of great concern in the evaluation of the commercial development of such a transport. One of the potential environmental impacts of a high speed civilian transport is the sonic boom generated by the aircraft and its effects on the population, wildlife, and structures in the vicinity of its flight path. If an HSCT aircraft is restricted from flying overland routes due to excessive booms, the commercial feasibility of such a venture may be questionable. NASA has taken the lead in evaluating and resolving the issues surrounding the development of a high speed civilian transport through its High-Speed Research Program (HSRP). The present paper discusses the usage of a Computational Fluid Dynamics (CFD) nonlinear code in predicting the pressure signature and ultimately the sonic boom generated by a high speed civilian transport. NASA had designed, built, and wind tunnel tested two low boom configurations for flight at Mach 2 and Mach 3. Experimental data was taken at several distances from these models up to a body length from the axis of the aircraft. The near field experimental data serves as a test bed for computational fluid dynamic codes in evaluating their accuracy and reliability for predicting the behavior of future HSCT designs. Sonic boom prediction methodology exists which is based on modified linear theory. These methods can be used reliably if near field signatures are available at distances from the aircraft where nonlinear and three dimensional effects have diminished in importance. Up to the present time, the only reliable method to obtain this data was via the wind tunnel with costly model construction and testing. It is the intent of the present paper to apply a modified three dimensional Euler code to predict the near field signatures of the two low boom configurations recently tested by NASA. Author

N94-33475*# Eagle Engineering, Inc., Hampton, VA.
OVERVIEW OF FEASIBILITY STUDY ON CONDUCTING OVERFLIGHT MEASUREMENTS OF SHAPED SONIC BOOM SIGNATURES USING RPV'S **c71**
Domenic J. Maglieri, Victor E. Sothcott, Thomas N. Keefer, Jr., and Percy J. Bobbitt *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 787-807 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

Before beginning this presentation, it is appropriate to acknowledge the sincere interest and financial support provided by the NASA LaRC under contract NAS9-17900. An outline of the material to be used in the present paper is given. It begins with a indication of the origin and objectives of the feasibility study. This is followed by a discussion of various simulation methods of establishing the persistence of shaped sonic boom signatures to large distances including the use of recoverable RPV/drones. The desirable features to be sought out in an RPV along with a rationale for the selection of a 'shaped' sonic boom signature will be addressed. Three candidate vehicles are examined as to their suitability with respect to a number of factors, in particular, modifiability. Area distributions and associated sonic boom signatures of the basic and modified Firebee vehicle will also be shown. An indication of the scope of the proposed wind tunnel and flight test programs will be presented including measurement technologies and predicted waveforms. Finally, some remarks will be made summarizing the study and highlighting the key findings. Author

N94-33476*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE NASA SPONSORED HSCT PROPULSION STUDIES **c07**
William C. Strack *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 813-827 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

One objective of the NASA-sponsored High Speed Civil Transport (HSCT) propulsion studies is to determine the potential benefits of alternative advanced technologies. These benefits should be explicitly expressed in terms of meeting either environmental acceptability or economic viability. The potential benefit information is used to screen alternative technology candidates to the most promising technologies that, if successfully developed, will enable the propulsion system to achieve high performance and low weight without unduly sacrificing favorable emissions and noise characteristics. A second objective is the provision of key information to high-level decision makers--enabling them to make rational decisions concerning the technology program content. It will be necessary to pursue more than one concept/technology until experimental validity is convincingly demonstrated. Some technologies will likely fail to achieve their stated goals, and timely program redirection depends upon far-sighted system studies to provide such information. Author

N94-33477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A NASA LEWIS COMPARATIVE PROPULSION SYSTEM ASSESSMENT FOR THE HIGH-SPEED CIVIL TRANSPORT **c07**
Jeffrey J. Berton, William J. Haller, Jonathan A. Seidel, and Paul F. Senick *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 831-865 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: High Speed Research (HSR) Propulsion System Studies; HRS System Study flowpath; design point aircraft sizing - no noise constraint; impact of noise constraint; noise impact on aircraft size; takeoff gross weight assessment; impact of High Speed Civil Transport (HSCT) high-altitude flyover noise; HSR NO(x) reduction status; current assessment of HSCT ozone depletion; influence of non-optimum cruise altitude on range; and influence of subsonic leg on range. Author

N94-33478*# General Electric Co., Cincinnati, OH.
P AND W/GE PROPULSION SYSTEMS STUDIES INTRODUCTION **c07**
Samual C. Gilkey and Richard W. Hines *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 869-877 (For primary document see N94-33462 10-02)
Avail: CASI HC A02/MF A04

The topics covered include the following: Pratt and Whitney (P&W)/ General Electric (GE) High Speed Civil Transport (HSCT) collaboration - joint propulsion studies and parallel technical organization; HSCT engine concepts; engine cycle/design ground rules - 2005 entry into service; engine evaluation criteria; 1991 HSCT system studies plan; P&W NASA study tasks; and GE NASA study tasks. Author

N94-33479*# General Electric Co., Cincinnati, OH. Aircraft Engines.
RESULTS OF GEAE HSCT PROPULSION SYSTEM STUDIES **c07**
Fred H. Krause *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 881-917 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

A very brief overview of the results of GE's High Speed Civil Transport (HSCT) propulsion system design studies is presented. Our plans for the remainder of this year are covered. Focus is on the acoustic nozzle design and its impact on the propulsion system performance. Our studies have shown that this component is a key driver on the HSCT propulsion and aircraft system designs. Cruise Cfg, acoustic performance, nozzle weight, and takeoff Cfg are all critical nozzle design features. Author

N94-33480*# Pratt and Whitney Aircraft, East Hartford, CT. Advanced Engine Programs.
P AND W PROPULSION SYSTEMS STUDIES RESULTS/STATUS **c07**
Martin G. Smith, Jr. and George A. Champagne *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 921-947 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: Pratt and Whitney (P&W) propulsion systems studies - NASA funded efforts to date; P&W engine concepts; P&W combustor focus - rich burn quick quench (RBQQ) concept; mixer ejector nozzle concept - large flow entrainment reduces jet noise; technology impact on NO(x) emissions - mature RBQQ combustor reduces NO(x) up to 85 percent; technology impact on sideline noise characteristics of Mach 2.4 turbine bypass engines (TBE's) - 600 lb/sec airflow size; technology impact on takeoff gross weight (TOGW) - provides up to 12 percent TOGW reduction; HSCT quiet engine concepts; TBE inlet valve/ejector nozzle concept schematic; mixed flow turbofan study; and exhaust nozzle conceptual design. Author

N94-33481*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LOW EMISSIONS COMBUSTOR TECHNOLOGY FOR HIGH-SPEED CIVIL TRANSPORT ENGINES **c07**
Richard W. Niedzwiecki *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 953-964 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: NASA High Speed Research (HSR) ozone research objectives; NO(x) formation; emission reduction; High Speed Civil Transport (HSCT) supersonic cruise combustion operating conditions; NO(x) correlations; typical NO(x) characteristics of a current technology and low NO(x) combustors; HSCT emission reduction strategies; variation of NO(x) with equivalence ratio; the Emission Reduction Program; and emission reduction milestones. Author

N94-33482*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THEORETICAL STUDY OF THERMODYNAMIC PROPERTIES AND REACTION RATES OF IMPORTANCE IN THE HIGH-SPEED RESEARCH PROGRAM **c77**
Stephen Langhoff, Charles Bauschlicher, and Richard Jaffe *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 967-980 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

One of the primary goals of NASA's high-speed research program is to determine the feasibility of designing an environmentally safe commercial supersonic transport airplane. The largest environmental concern is focused on the amount of ozone destroying nitrogen oxides (NO(x)) that would be injected into the lower stratosphere during the cruise portion of the flight. The limitations placed on NO(x) emission require more than an order of magnitude reduction over current engine designs. To develop strategies to meet this goal requires first gaining a fundamental understanding of the combustion chemistry. To accurately model the combustor requires a computational fluid dynamics approach that includes both turbulence and chemistry. Since many of the important chemical processes in this regime involve highly reactive radicals, an experimental determination of the required thermodynamic data and rate constants is often very difficult. Unlike experimental approaches, theoretical methods are as applicable to highly reactive species as stable ones. Also our approximation of treating the dynamics classically becomes more accurate with increasing temperature. In this article we review recent progress in generating thermodynamic properties and rate constants that are required to understand NO(x) formation in the combustion process. We also describe our one-dimensional modeling efforts to validate an NH3 combustion reaction mechanism. We have been working in collaboration with researchers at LeRC, to ensure that our theoretical work is focused on the most important thermodynamic quantities and rate constants required in the chemical data base. Author

N94-33483*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HSR COMBUSTION ANALYTICAL RESEARCH **c25**
H. Lee Nguyen *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 983-996 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

Increasing the pressure and temperature of the engines of a new generation of supersonic airliners increases the emissions of nitrogen oxides (NO(x)) to a level that would have an adverse impact on the Earth's protective ozone layer. In the process of evolving and implementing low emissions combustor technologies, NASA LeRC has pursued a combustion analysis code program to guide combustor design processes, to identify potential concepts of the greatest promise, and to optimize them at low cost, with short turnaround time. The computational analyses are evaluated at actual engine operating conditions. The approach is to upgrade and apply advanced computer programs for gas turbine applications. Efforts were made in further improving the code capabilities for modeling the physics and the numerical methods of solution. Then test cases and measurements from experiments are used for code validation. Author

N94-33484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LeRC IN-HOUSE EXPERIMENTAL RESEARCH c25
Valerie J. Lyons *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 999-1023 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: LeRC in-house experimental research; combustion concepts; schedule for in-house experiments; lean premixed prevaporized combustion; comparisons of low NO(x) lean premixed/prevaporized data; rich burn/quick quench/lean burn (RQL); RQL combustion; fuel rich catalytic combustion; advanced diagnostics; and ceramic matrix liner test rig. Author

N94-33485*# General Electric Co., Cincinnati, OH. Aircraft Enginges.
LEAN BURN COMBUSTOR TECHNOLOGY AT GE AIRCRAFT ENGINES c25
Willard J. Dodds *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 1027-1042 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

This presentation summarizes progress to date at GE Aircraft Engines in demonstration of a lean combustion system for the High Speed Civil Transport (HSCT). These efforts were supported primarily by NASA contracts, with the exception of initial size and weight estimates and development of advanced diagnostics which were conducted under GE Independent Research and Development projects. Key accomplishments to date are summarized below. Author

N94-33486*# Pratt and Whitney Aircraft, East Hartford, CT.
RICH BURN COMBUSTOR TECHNOLOGY AT PRATT AND WHITNEY c07
Robert P. Lohmann and T. J. Rosfjord *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 1045-1056 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

The topics covered include the following: near term objectives; rich burn quick quench combustor (RBQC); RBQC critical technology areas; cylindrical RBQQ combustor rig; modular RBQQ combustor; cylindrical rig objectives; quench zone mixing; noneffusive cooled liner; variable geometry requirements; and sector combustor rig. Author

N94-33487*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
FIRST ANNUAL HIGH-SPEED RESEARCH WORKSHOP, PART 3
Allen H. Whitehead, Jr., comp. Apr. 1992 590 p Workshop held in Williamsburg, VA, 14-16 May 1991; sponsored by NASA, Washington
(RTOP 537-01-22-01)
(NASA-CP-10087-Pt-3; NAS 1.55:10087-Pt-3) Avail: CASI HC A25/MF A06

The First High-Speed Research (HSR) Workshop was hosted by NASA LaRC and was held 14-16 May 1991, in Williamsburg, Virginia. The purpose of the workshop was to provide a national forum for the government, industry, and university participants to present and discuss important technology issues related to the development of a commercially viable, environmentally compatible, U.S. High-Speed Civil Transport. The workshop sessions are organized around the major task elements in NASA's Phase 1 High-Speed Research Program which basically addresses the environmental issues of atmospheric emissions, community noise, and sonic boom. For individual titles, see N94-33488 through N94-33516.

N94-33488*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AEROACOUSTICS ANALYSIS AND COMMUNITY NOISE OVERVIEW
Robert A. Golub and Paul T. Soderman *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1065-1071 (For primary document see N94-33487 10-02)
Avail: CASI HC A02/MF A06

The goals of the High Speed Research Program are focused on three major environmental issues: atmospheric effect, airport community noise, and sonic booms. The issues are basic concerns that require better understanding before further HSRP endeavors can be addresses. This paper discusses airport community noise and aeroacoustic analysis. Author

N94-33489*# Lockheed Aeronautical Systems Co., Marietta, GA.
NEW BROADBAND SHOCK NOISE MODEL AND COMPUTER CODE FOR ANOPP c71
N. N. Reddy *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1075-1101 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The basic mechanism for broadband shock noise in supersonic jets is the interaction between the shock waves and the turbulence in the jet exhaust. This source is in addition to jet mixing noise. Author (revised)

N94-33490*# Boeing Commercial Airplane Co., Seattle, WA.
COMMUNITY NOISE TECHNOLOGY NEEDS: BOEING'S PERSPECTIVE c71
Gene L. Nihart *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1105-1119 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

Airport community acceptance of High Speed Civil Transport (HSCT) noise levels will depend on the relative noise levels of airplanes flying at the time of introduction. The 85 dBA noise contours for the range of large subsonic airplanes that are expected to be in service in the early 21st century are shown as a shaded area. A certifiable HSCT noise contour as shown, would be somewhat wider along the runway, but about the same in the residential areas downrange. An HSCT noise rule should insure this noise capability. Author

N94-33491*# Douglas Aircraft Co., Inc., Long Beach, CA.
AERO ACOUSTIC ANALYSIS AND COMMUNITY NOISE. HSCT CLIMB TO CRUISE NOISE ASSESSMENT c71
Alan K. Mortlock *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1123-1133 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The widely accepted industry High Speed Civil Transport (HSCT) design goal for exterior noise is to achieve Federal Aviation Regulation (FAR) Part 36 Stage 3 noise limits currently required for new subsonic aircraft. The three phases of the concern are as follows: (1) airport noise abatement at communities close to the airport, (2) climb power opening-up procedures, and (3) the climb to cruise phase affecting communities far from the airport. Author (revised)

N94-33492*# Lockheed Engineering and Sciences Co., Hampton, VA.
ANOPP/VMS HSCT GROUND CONTOUR SYSTEM c71
John Rawls, Jr. and Lou Glaab *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1137-1157 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

This viewgraph shows the integration of the Visual Motion Simulator with ANOPP. ANOPP is an acronym for the Aircraft NOise Prediction Program. It is a computer code consisting of dedicated noise prediction modules for jet, propeller, and rotor powered aircraft along with flight support and noise propagation modules, all executed under the control of an executive system. The Visual Motion Simulator (VMS) is a ground

based motion simulator with six degrees of freedom. The transport-type cockpit is equipped with conventional flight and engine-thrust controls and with flight instrument displays. Control forces on the wheel, column, and rudder pedals are provided by a hydraulic system coupled with an analog computer. The simulator provides variable-feel characteristics of stiffness, damping, coulomb friction, breakout forces, and inertia. The VMS provides a wide range of realistic flight trajectories necessary for computing accurate ground contours. The NASA VMS will be discussed in detail later in this presentation. An equally important part of the system for both ANOPP and VMS is the engine performance. This will also be discussed in the presentation. Author (revised)

N94-33493*# Lockheed Engineering and Sciences Co., Hampton, VA.
HIGH PERFORMANCE JET-ENGINE FLIGHT TEST DATA BASE FOR HSR **c71**

Jeffrey Kelly *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1161-1177 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The primary acoustic priority of the flight test data base for HSR is the validation of the NASA Aircraft Noise Prediction Program (ANOPP) and other source noise codes. Also, the noise measurements are an important support function for the High Lift Program devoted to HSR. Another concern that will be addressed is a possible noise problem 7-20 miles from take-off during climbout. The attention arises from the higher speeds envisioned for the HSCT compared to conventional aircraft causing levels to increase because of Doppler amplification in conjunction with high source levels due to jet noise. An attempt may be made to measure airframe noise for the F-16XL test which would provide an assessment of this noise component for delta wing aircraft. Author

N94-33494*# Lockheed Engineering and Sciences Co., Hampton, VA.
STATUS AND PLANS FOR THE ANOPP/HSR PREDICTION SYSTEM **c71**

Sandra K. Nolan *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1181-1196 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

ANOPP is a comprehensive prediction system which was developed and validated by NASA. Because ANOPP is a system prediction program, it allows aerospace industry researchers to create trade-off studies with a variety of aircraft noise problems. The extensive validation of ANOPP allows the program results to be used as a benchmark for testing other prediction codes. Author (revised)

N94-33495*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ATMOSPHERIC EFFECTS ON SONIC BOOM: A PROGRAM REVIEW **c71**

Gerry L. McAninch *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1201-1207 (For primary document see N94-33487 10-02)
Avail: CASI HC A02/MF A06

The program goals were determined after consideration of the weaknesses in our understanding of atmospheric effects on sonic boom waveforms left in the wake of the cancellation of the U.S. SST in the 70's and the advancements in acoustics and atmospheric science since that time. For example, a considerable body of knowledge on molecular absorption has built up in the acoustics community over the last 15 years and this has not been incorporated into the sonic boom theory. Further, it was felt that the understanding of atmospheric turbulence had also advanced considerably during that time period. Therefore, key elements of the current program are the development of an improved atmospheric absorption model and an improved atmospheric turbulence model. The advances made in computer power over the last 15 years were also considered, and will be utilized to remove restrictions on the analytical model for turbulence effects on sonic boom waveforms. Although the majority of disturbing sonic booms will not occur at focuses or caustics, it was felt that this was an area that required further understanding, thus it will be looked into. Finally, in order to insure that the current effort, which is basically analytical in nature, retains a firm grasp on reality, a data base of sonic boom waveforms and associated weather data is being compiled, and a set of scale model experiments is being planned to guide the overall efforts. Author (revised)

N94-33496*# Pennsylvania State Univ., University Park, PA. Graduate Program in Acoustics.
RELAXATION AND TURBULENCE EFFECTS ON SONIC BOOM SIGNATURES **c71**

Allan D. Pierce and Victor W. Sparrow *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1211-1240 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The rudimentary theory of sonic booms predicts that the pressure signatures received at the ground begin with an abrupt shock, such that the overpressure is nearly abrupt. This discontinuity actually has some structure, and a finite time is required for the waveform to reach its peak value. This portion of the waveform is here termed the rise phase, and it is with this portion that this presentation is primarily concerned. Any time characterizing the duration of the rise phase is loosely called the 'rise time.' Various definitions are used in the literature for this rise time. In the present discussion the rise time can be taken as the time for the waveform to rise from 10 percent of its peak value to 90 percent of its peak value. The available data on sonic booms that appears in the open literature suggests that typical values of shock over-pressure lie in the range of 30 Pa to 200 Pa, typical values of shock duration lie in the range of 150 ms to 250 ms, and typical values of the rise time lie in the range of 1 ms to 5 ms. The understanding of the rise phase of sonic booms is important because the perceived loudness of a shock depends primarily on the structure of the rise phase. A longer rise time typically implies a less loud shock. A primary question is just what physical mechanisms are most important for the determination of the detailed structure of the rise phase. Author (revised)

N94-33497*# Wyle Labs., Inc., Arlington, VA.
THE EFFECT OF TURBULENCE AND MOLECULAR RELAXATION ON SONIC BOOM SIGNATURES **c71**

Kenneth J. Plotkin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1243-1262 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

Our objectives are to assess the effect of turbulence and molecular absorption (which is now known to be a key factor in sonic boom shock structure) on shaped sonic booms. Today I will discuss the combination of physical mechanisms for idealized turbulence. In parallel, we are reviewing models for mixed layer turbulence, and these physical effects will eventually be generalized. Author

N94-33498*# Mississippi Univ., University, MS. Physical Acoustics Research Group.
STATISTICAL AND NUMERICAL STUDY OF THE RELATION BETWEEN WEATHER AND SONIC BOOM CHARACTERISTICS **c71**

Lixin Yao, Henry E. Bass, Richard Raspet, and Walton E. McBride *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1265-1283 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

NASA measured sonic boom characteristics near Edwards Air Force Base from 11/66 to 1/67. Thirty four flights by an F-104 were recorded at an altitude of about 31,000 feet and flying speed of Mach 1.3. Forty two microphones were placed on the ground directly under the fight track. Each microphone recorded boom shape, rise time, peak overpressure, total boom duration, positive duration, and positive impulse. Author (revised)

N94-33499*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OVERVIEW OF NASA HUMAN RESPONSE TO SONIC BOOM PROGRAM **c52**

Kevin P. Shepherd *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1287-1291 (For primary document see N94-33487 10-02)
Avail: CASI HC A01/MF A06

For some routes the ability to fly at supersonic speeds over land as

well as over water would greatly enhance the time benefit to the passenger. It would also increase the productivity and economic viability of the aircraft. There are no reliable guidelines which can be used to determine a sonic boom exposure which would be acceptable for overland supersonic flight. In addition to the peak pressure of the sonic boom, the detailed shape of the signature will also influence the perception, and therefore the community response, to sonic boom exposures. Initially, the program aims to develop the capability to predict human response to individual sonic booms. This will enable a quantitative assessment of the benefit of 'low boom' aircraft configurations and will also serve to guide the design of the aircraft and its operating conditions. This capability will form the foundation of studies to determine the relationship between sonic boom exposure and community response. Only then will it be possible to assess the feasibility of acceptable overland supersonic flight. Author (revised)

N94-33500*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SONIC BOOM ACCEPTABILITY STUDIES **c71**

Kevin P. Shepherd, Brenda M. Sullivan, Jack D. Leatherwood, and David A. McCurdy *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1295-1311 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The determination of the magnitude of sonic boom exposure which would be acceptable to the general population requires, as a starting point, a method to assess and compare individual sonic booms. There is no consensus within the scientific and regulatory communities regarding an appropriate sonic boom assessment metric. Loudness, being a fundamental and well-understood attribute of human hearing was chosen as a means of comparing sonic booms of differing shapes and amplitudes. The figure illustrates the basic steps which yield a calculated value of loudness. Based upon the aircraft configuration and its operating conditions, the sonic boom pressure signature which reaches the ground is calculated. This pressure-time history is transformed to the frequency domain and converted into a one-third octave band spectrum. The essence of the loudness method is to account for the frequency response and integration characteristics of the auditory system. The result of the calculation procedure is a numerical description (perceived level, dB) which represents the loudness of the sonic boom waveform. Author (revised)

N94-33501*# Georgia Inst. of Tech., Atlanta, GA.

GEORGIA TECH SONIC BOOM SIMULATOR **c71**

Krish K. Ahuja *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1315-1342 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

To examine the building and human response to sonic boom in the range 3 Hz to 30 Hz, Georgia Institute of Technology is building a special acoustic driver system to simulate sonic boom. To support the NASA LaRC program on building and human response, this simulator's capability has been extended to an upper frequency of 4 KHz. A residential test house was made available by Georgia Tech for these tests. At the time of preparation of this document, most of the acoustic drivers and the associated electronics have been built and assembled. The system has, however, not been fully tested. The following pages provide an overview of the progress to date. The acoustic driver systems, and the principle of their operation together with the test house are described. Future plans are also summarized. Author (revised)

N94-33502*# Wyle Labs., Inc., El Segundo, CA.

SONIC BOOM (HUMAN RESPONSE AND ATMOSPHERIC EFFECTS) OUTDOOR-TO-INDOOR RESPONSE TO MINIMIZED SONIC BOOMS **c71**

David Brown and Louis C. Sutherland *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1345-1363 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The preferred descriptor to define the spectral content of sonic booms is the Sound Exposure Spectrum Level, LE(f). This descriptor represents the spectral content of the basic noise descriptors used for describing any single event--the Sound Exposure Level, LE. The latter is equal to ten times the logarithms, to the base ten, of the integral, over the duration of the event, of the square of the instantaneous acoustic pressure, divided by the square of the reference pressure, 20 micro-Pa. When applied to the evaluation of community response to sonic booms, it is customary to use the so-called C-Weighted Sound Exposure Level, LCE, for which the frequency content of the instantaneous acoustic pressure is modified by the C-Weighting curve. Author (revised)

N94-33503*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROPULSION AIRFRAME INTEGRATION SESSION OVERVIEW AND REVIEW OF LEWIS PAI EFFORTS **c07**

Peter G. Batterton *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1369-1379 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

Propulsion/Airframe Integration (PAI) is a key issue for the High Speed Civil Transport. The aircraft performance, economics, and environmental acceptability can be adversely affected if the integration of the propulsion system and the airframe is not addressed properly or in a timely manner. Some of the goals are listed in this figure. In particular, these goals are highly influenced by how successfully the propulsion system and airframe are integrated. These goals were grouped by the 'Aero' and 'Propulsion' categories to suggest which group of technologists will likely be addressing them. In terms of the NASA High Speed Research Program, the ultimate objective for propulsion/airframe integration is to demonstrate the technologies for achievement of these goals on a 'single' integrated configuration. Author (revised)

N94-33504*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

NACELLE-WING INTEGRATION **c05**

Gelsomina Cappuccio *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1383-1399 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The Aerodynamics Division at NASA ARC is participating in the propulsion airframe integration phase of the High Speed Research Program. The two areas of research being pursued include an experimental program and analysis using computational fluid dynamics. The applied Aerodynamics Branch is conducting the experimental program, which will involve a nacelle airframe model that was tested in the Ames 11- by 11-Foot Transonic Wind Tunnel in 1973. This branch will also assess various Euler codes in predicting nacelle airframe interference effects. The goal is to provide the industry with the necessary data and tools to design a high speed civil transport with favorable propulsion airframe interference. Author (revised)

N94-33505*# Boeing Commercial Airplane Co., Seattle, WA.

HSCT INLET DEVELOPMENT ISSUES **c05**

Joseph L. Koncsek *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1403-1421 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The purpose of this presentation is to highlight the issues affecting the development of engine air inlets for the HSCT. The Propulsion Airframe Integration Technology (PAIT) contract sponsored by NASA LeRC is an important element in the evolution of the propulsion system that will eventually power the HSCT. Most of the material presented here is based on work performed by The Boeing Company under Task 1 and 2 of PAIT. From the propulsion perspective, the premier technology issues associated with the HSCT are airport noise and high altitude emissions. The sources are the nozzle and combustor, respectively. For the inlet the most challenging issues are associated with integration. Among the issues are the following: integration with the main landing gear--protection from FOD and water and slush ingestion from the runway; integration with the engine--ensuring engine/inlet airflow matching, normal shock stability during engine airflow transients, and keeping total pressure distortion within acceptable limits; integration with the wing--minimizing nacelle/wing interference drag and inlet flowfield velocity distortion. Author (revised)

N94-33506*# Douglas Aircraft Co., Inc., Long Beach, CA.

STATUS OF AN INLET CONFIGURATION TRADE STUDY FOR THE DOUGLAS HSCT **c05**

Jay R. Jones and H. Robert Welge *In* NASA. Langley Research Center,

First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1425-1436 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

An inlet concept integration trade study for an HSCT is being conducted under contract to NASA LeRC. The HSCT mission has a supersonic cruise Mach number of 2.4 and a subsonic cruise Mach number of 0.95. The engine selected for this study is the GE VCE (variable cycle engine) with FLADE (fan on blade). Six inlet configurations will be defined. Inlet configurations will be axisymmetric and rectangular mixed-compression inlets in single-engine nacelles. Airplane performance for each inlet configuration will be estimated and then compared. The most appropriate inlet configuration for this airplane/engine combination will be determined by Sep. 1991. Author (revised)

N94-33507*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
TRANSONIC AIRFRAME PROPULSION INTEGRATION **c07**
Robert E. Coltrin, Bobby W. Sanders, and Daniel P. Bencze *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1439-1459 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

This chart shows the time line for HSR propulsion/airframe integration program. HSR Phase 1 efforts are underway in both propulsion and aerodynamics. The propulsion efforts focus on cycles, inlets combustors and nozzles that will be required to reduce nitrogen oxide (NOX) at cruise and noise at takeoff and landing to acceptable levels. The aerodynamic efforts concentrate on concepts that will reduce sonic booms and increase the lift/drag (L/D) ratio for the aircraft. The Phase 2 critical propulsion component technology program will focus on large scale demonstrators of the inlet, fan, combustor, and nozzle. The hardware developed here will feed into the propulsion system program which will demonstrate overall system technology readiness, particularly in the takeoff and supersonic cruise speed ranges. The Phase 2 aerodynamic performance and vehicle integration program will provide a validated data base for advanced airframe/control/integration concepts over the full HSR speed range. The results of this program will also feed into the propulsion system demonstration program, particularly in the critical transonic arena. Author (revised)

N94-33508*# Lockheed Engineering and Sciences Co., Hampton, VA.
RESULTS OF A PRELIMINARY INVESTIGATION OF INLET UNSTART ON A HIGH-SPEED CIVIL TRANSPORT AIRPLANE CONCEPT **c05**
Christopher S. Domack *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1463-1479 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The aircraft design engineer of today is tasked with satisfying an increasing number of conflicting requirements. The fact that conflict in these requirements may be technically, economically, or politically motivated usually compounds the difficulty of determining the best solution to a design issue. In this regard, propulsion/airframe integration for supersonic airplanes must rank as one of the most challenging aspects of airplane design. For the cruise Mach numbers currently being considered for High-Speed Civil Transport (HSCT) airplanes, the inlet requirements of low drag, low bleed flow, and high pressure recovery appear to be best met with a mixed-compression design. Unfortunately, these desirable attributes come with a highly undesirable companion: the inlet unstart phenomenon. Concern over the effects of a mixed-compression inlet unstart on the vehicle dynamics of large, high-speed aircraft is not new; a comprehensive wind-tunnel study addressing the problem was published in 1962. Additional investigations of the problem were made throughout the United States SST program and the follow-on NASA program into the late 1970's. The current study sought to examine the magnitude of the problem in order to determine if an inlet unstart posed a potential hazard severe enough to preclude the use of mixed-compression inlets on proposed HSCT concepts. Author (revised)

N94-33509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STATUS OF THE VARIABLE DIAMETER CENTERBODY INLET PROGRAM **c05**
John D. Saunders and A. A. Linne *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1483-1504 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The Variable Diameter Centerbody (VDC) inlet is an ongoing research program at LeRC. The VDC inlet is a mixed compression, axisymmetric inlet that has potential application on the next generation supersonic transport. This inlet was identified as one of the most promising axisymmetric concepts for supersonic cruise aircraft during the SCAR program in the late 1970's. Some of its features include high recovery, low bleed, good angle-of-attack tolerance, and excellent engine airflow matching. These features were demonstrated at LeRC in the past by the design and testing of fixed hardware models. A current test program in the LeRC 10' x 10' Supersonic Wind Tunnel (SWT) will attempt to duplicate these features on model hardware that actually incorporates a flight-like variable diameter centerbody mechanism. Author (revised)

N94-33510*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT INTEGRATED PROPULSION CONTROL ISSUES **c07**
Christopher M. Carlin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1507-1518 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The propulsion control system affects the economics of the HSCT through the mechanisms indicated. Weight reduction is paramount in an aircraft of this type. Significant reductions are possible relative to the SST or even current technology if improvements are made in areas such as high temperature electronics. Dependability is an increasingly important parameter in all aircraft, but the higher capital cost of the HSCT makes it doubly important. Conversely the more difficult HSCT design problem makes it more difficult to achieve. Integration of propulsion controls will make it possible to improve both the static and dynamic performance of the HSCT propulsion system. Noise and emissions requirements may introduce novel control system requirements such as automatically programmed takeoff thrust for noise abatement. Control system development technology is evolving. For HSCT, highly automated and thoroughly validated tools will be required to reliably achieve desired system performance at introduction, and to reduce development costs. A technology plan was developed to prepare for HSCT development. This presentation addresses the portion of the plan required to demonstrate technology readiness for the HSCT in the late 1990's rather than the technology development currently in progress. Author (revised)

N94-33511*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ENABLING PROPULSION MATERIALS FOR HIGH-SPEED CIVIL TRANSPORT ENGINES **c07**
Joseph R. Stephens and Thomas P. Herbell *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1523-1546 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

NASA Headquarters and LeRC have advocated an Enabling Propulsion Materials Program (EPM) to begin in FY-92. The High Speed Research Phase 1 program which began in FY-90 has focused on the environmental acceptability of a High Speed Civil Transport (HSCT). Studies by industry, including Boeing, McDonnell Douglas, GE Aircraft Engines, and Pratt & Whitney Aircraft, and in-house studies by NASA concluded that NO(x) emissions and airport noise reduction can only be economically achieved by revolutionary advancements in materials technologies. This is especially true of materials for the propulsion system where the combustor is the key to maintaining low emissions, and the exhaust nozzle is the key to reducing airport noise to an acceptable level. Both of these components will rely on high temperature composite materials that can withstand the conditions imposed by commercial aircraft operations. The proposed EPM program will operate in conjunction with the HSR Phase 1 Program and the planned HSR Phase 2 program slated to start in FY-93. Components and subcomponents developed from advanced materials will be evaluated in the HSR Phase 2 Program. Author (revised)

N94-33512*# Pratt and Whitney Aircraft, West Palm Beach, FL.
COMBUSTOR MATERIALS REQUIREMENTS AND STATUS OF CERAMIC MATRIX COMPOSITES **c24**
Ralph J. Hecht and Andrew M. Johnson *In* NASA. Langley Research

Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1549-1564 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The HSCT combustor will be required to operate with either extremely rich or lean fuel/air ratios to reduce NO(x) emission. NASA High Speed Research (HSR) sponsored programs at Pratt & Whitney (P&W) and GE Aircraft Engines (GEAE) have been studying rich and lean burn combustor design approaches which are capable of achieving the aggressive HSCT NO(x) emission goals. In both of the combustor design approaches under study, high temperature (2400-3000 F) materials are necessary to meet the HSCT emission goals of 3-8 gm/kg. Currently available materials will not meet the projected requirements for the HSCT combustor. The development of new materials is an enabling technology for the successful introduction to service of the HSCT. Author (revised)

N94-33513*# General Electric Co., Cincinnati, OH. Aircraft Engines.
NOZZLE MATERIAL REQUIREMENTS AND THE STATUS OF INTERMETALLIC MATRIX COMPOSITES **c24**
Andrew M. Johnson and Ralph J. Hecht *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1567-1582 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The HSCT exhaust nozzle must manage high temperature exhaust gases and pressure gradients while meeting HSCT economic and noise goals. The important features and requirements for an HSCT exhaust nozzle are shown for a 2DCD (two-dimensional convergent-divergent) design. The same requirements would apply to an axisymmetric design. Exhaust nozzle weight has an adverse effect on the overall aircraft range, payload, and engine specific fuel consumption and is therefore the primary driver for advanced exhaust nozzle materials. Because of the large airflow and pressure gradients, exhaust nozzles are extremely large and heavy when made from current materials. The use of advanced materials with higher specific strength will reduce the weight of exhaust nozzle components. In addition to the flow of high-temperature exhaust gases into the exhaust nozzle, ambient air is entrained to reduce gas exit velocities and suppress sound. This leads to components exposed to extremely high temperature gradients and, hence, high thermal stresses. Further, exhaust gases are highly oxidizing; material environmental resistance will be an important factor for long life. Several viable concepts have been identified to reduce noise through the mixture of exhaust and ambient air. Sound can be further suppressed by acoustic panels that absorb high-frequency noise.
Author (revised)

N94-33514*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AIRFRAME MATERIALS FOR HSR **c24**
Thomas T. Bales *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1585-1606 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

Vugraphs are presented to show the use of refractory materials for the skin of the High speed Civil Transport (HSCT). Examples are given of skin temperature ranges, failure mode weight distribution, tensile properties as a function of temperature, and components to be constructed from composite materials. The responsibilities of various aircraft companies for specific aircraft components are defined. Author (revised)

N94-33515*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT AIRFRAME MATERIALS: THE BOEING PERSPECTIVE **c24**
Donald L. Grande *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1609-1621 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

Vugraphs are presented on the effect of cruise Mach number on the maximum takeoff weight of the High Speed Commercial Transport (HSCT). Predictions are made of the service life of the aircraft, and the aging effects of various candidate materials are examined. The objective of the study is to develop and evaluate low cost airplane designs by examining alternate structural, material, and manufacturing concepts, for the purpose of advising material suppliers and NASA on desired materials, product forms, and processing techniques. Author (revised)

N94-33516*# Douglas Aircraft Co., Inc., Long Beach, CA.
HSCT MATERIALS AND STRUCTURES: AN MDC PERSPECTIVE **c24**
Jay O. Sutton *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1625-1641 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

The key High Speed Civil Transport (HSCT) features which control the materials selection are discussed. Materials are selected based on weight and production economics. The top-down and bottoms-up approaches to material selection are compared for the Mach 2.4 study baseline aircraft. The key materials and structures related tasks which remain to be accomplished prior to proceeding with the building of the HSCT aircraft are examined. Author

N94-33517*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
FIRST ANNUAL HIGH-SPEED RESEARCH WORKSHOP, PART 4
Allen H. Whitehead, Jr., comp. Apr. 1992 390 p Workshop held in Williamsburg, VA, 14-16 May 1991; sponsored by NASA, Washington
(RTOP 537-01-22-01)
(NASA-CP-10087-Pt-4; NAS 1.55:10087-Pt-4) Avail: CASI HC A17/MF A04

Papers presented at the First Annual High Speed Research Workshop held in Williamsburg, Viginia, on May 14-16, 1991 are presented. This NASA-sponsored workshop provided a national forum for presenting and discussing important technology issues related to the definition of an economically viable and environmentally compatible High Speed Civil Transport. The sessions are developed around the technical components of NASA's Phase 1 High Speed Research Program which addresses the environmental issues of atmospheric emissions, community noise, and sonic boom. In particular, this part of the publication, Part 4, addresses high lift research and supersonic laminar flow control. For individual titles, see N94-33518 through N94-33531.

N94-33518*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OVERVIEW OF NASA HSR HIGH-LIFT PROGRAM
William P. Gilbert *In its* First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1647-1659 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs and discussion of the NASA High-Speed Research (HSR) Program being conducted to develop the technologies essential for the successful U.S. development of a commercial supersonic air transport in the 2005 timeframe are provided. The HSR program is being conducted in two phases, with the first phase stressing technology to ensure environmental acceptability and the second phase stressing technology to make the vehicle economically viable (in contrast to the current Concorde design). During Phase 1 of the program, a key element of the environmental emphases is minimization of community noise through effective engine nozzle noise suppression technology and through improving the performance of high-lift systems. An overview of the current Phase 1 High-Lift Program, directed at technology for community noise reduction, is presented. The total target for takeoff engine noise reduction to meet expected regulations is believed to be about 20 EPNdB. The high-lift research is stressing the exploration of innovative high-lift concepts and advanced flight operations procedures to achieve a substantial (approximately 6 EPNdB) reduction in community noise to supplement the reductions expected from engine nozzle noise suppression concepts; primary concern is focused on the takeoff and climbout operations where very high engine power settings are used. Significant reductions in aerodynamic drag in this regime will allow substantial reductions in the required engine thrust levels and therefore reductions in the noise generated. Derived from text

N94-33519*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
STATUS OF LaRC HSCT HIGH-LIFT RESEARCH
Paul L. Coe *In its* First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1663-1691 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs for a status report of the NASA Langley Reseach Center High Speed Civil Transport (HSCT) High-Lift Research Program are

provided. A listing of available models and previous wind tunnel studies are presented. Objectives and approach of the piloted simulation program are given. The HSCT High-Lift Research plans are listed and briefly described. CASI

N94-33520*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

STATUS OF CFD FOR LaRC'S HSR HIGH-LIFT PROGRAM

Edgar G. Waggoner and Jerry C. South, Jr. *In its* First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1695-1717 (For primary document see N94-33517 10-02)

Avail: CASI HC A03/MF A04

The viewgraphs for a status report for using computational fluid dynamics (CFD) for NASA Langley's Research Center High Speed Research High-Lift Program are provided. The objectives of CFD applications, the approach to developing appropriate CFD codes, and the dominant flow mechanisms are outlined. Possible CFD codes are compared; graphs comparing force coefficients, surface pressure distribution, and force are included. The plans for using CFD applications are listed. CASI

N94-33521*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

HSR HIGH LIFT RESEARCH PROGRAM: STATUS AND PLANS

Jim Rose *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1721-1738 (For primary document see N94-33517 10-02)

Avail: CASI HC A03/MF A04

The viewgraphs for a report on the status and plans for High Speed Research (HSR) programs are provided. Benefits of improved high lift performance are listed. The objectives, approach, and experimental results are outlined. Future experimental tests and additional research opportunities are listed. The use of computational fluid dynamics (CFD) in high lift research is also outlined. CASI

N94-33522*# Boeing Commercial Airplane Co., Seattle, WA.

HSCT HIGH LIFT SYSTEM AERODYNAMIC REQUIREMENTS

John A. Paulson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1741-1763 (For primary document see N94-33517 10-02)

Avail: CASI HC A03/MF A04

The viewgraphs and discussion of high lift system aerodynamic requirements are provided. Low speed aerodynamics has been identified as critical to the successful development of a High Speed Civil Transport (HSCT). The airplane must takeoff and land at a sufficient number of existing or projected airports to be economically viable. At the same time, community noise must be acceptable. Improvements in cruise drag, engine fuel consumption, and structural weight tend to decrease the wing size and thrust required of engines. Decreasing wing size increases the requirements for effective and efficient low speed characteristics. Current design concepts have already been compromised away from better cruise wings for low speed performance. Flap systems have been added to achieve better lift-to-drag ratios for climb and approach and for lower pitch attitudes for liftoff and touchdown. Research to achieve improvements in low speed aerodynamics needs to be focused on areas most likely to have the largest effect on the wing and engine sizing process. It would be desirable to provide enough lift to avoid sizing the airplane for field performance and to still meet the noise requirements. The airworthiness standards developed in 1971 will be the basis for performance requirements for an airplane that will not be critical to the airplane wing and engine size. The lift and drag levels that were required to meet the performance requirements of tentative airworthiness standards established in 1971 and that were important to community noise are identified. Research to improve the low speed aerodynamic characteristics of the HSCT needs to be focused in the areas of performance deficiency and where noise can be reduced. Otherwise, the wing planform, engine cycle, or other parameters for a superior cruising airplane would have to be changed. Derived from text

N94-33523*# Douglas Aircraft Co., Inc., Long Beach, CA.

HSCT HIGH-LIFT TECHNOLOGY REQUIREMENTS

D. L. Antani and J. M. Morgenstern *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1767-1788 (For primary document see N94-33517 10-02)

Avail: CASI HC A03/MF A04

The viewgraphs and discussion of high lift needs and related aerodynamic goals established in system studies are described. The goals are presented for the takeoff, approach, and subsonic climb and cruise modes. The status of the related high lift databases and available design and analysis methods are described. Various high lift research and technology areas for future work including innovative concepts verification, flap design, computational fluid dynamics (CFD) calibration and application, high Reynolds number testing, subsonic/transonic flap optimization, and flight testing are described. CASI

N94-33524*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

LIFT ENHANCEMENT BY TRAPPED VORTEX

Vernon J. Rossow *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1791-1806 (For primary document see N94-33517 10-02)

Avail: CASI HC A03/MF A04

The viewgraphs and discussion of lift enhancement by trapped vortex are provided. Efforts are continuously being made to find simple ways to convert wings of aircraft from an efficient cruise configuration to one that develops the high lift needed during landing and takeoff. The high-lift configurations studied here consist of conventional airfoils with a trapped vortex over the upper surface. The vortex is trapped by one or two vertical fences that serve as barriers to the oncoming stream and as reflection planes for the vortex and the sink that form a separation bubble on top of the airfoil. Since the full three-dimensional unsteady flow problem over the wing of an aircraft is so complicated that it is hard to get an understanding of the principles that govern the vortex trapping process, the analysis is restricted here to the flow field illustrated in the first slide. It is assumed that the flow field between the two end plates approximates a streamwise strip of the flow over a wing. The flow between the endplates and about the airfoil consists of a spanwise vortex located between the suction orifices in the endplates. The spanwise fence or spoiler located near the nose of the airfoil serves to form a separated flow region and a shear layer. The vorticity in the shear layer is concentrated into the vortex by withdrawal of fluid at the suction orifices. As the strength of the vortex increases with time, it eventually dominates the flow in the separated region so that a shear or vertical layer is no longer shed from the tip of the fence. At that point, the vortex strength is fixed and its location is such that all of the velocity contributions at its center sum to zero thereby making it an equilibrium point for the vortex. The results of a theoretical analysis of such an idealized flow field are described. Derived from text

N94-33525*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA F-16XL SUPERSONIC LAMINAR FLOW CONTROL PROGRAM OVERVIEW

Michael C. Fischer *In its* First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1811-1820 (For primary document see N94-33517 10-02)

Avail: CASI HC A02/MF A04

The viewgraphs and discussion of the NASA supersonic laminar flow control program are provided. Successful application of laminar flow control to a High Speed Civil Transport (HSCT) offers significant benefits in reductions of take-off gross weight, mission fuel burn, cruise drag, structural temperatures, engine size, emissions, and sonic boom. The ultimate economic success of the proposed HSCT may depend on the successful adaption of laminar flow control, which offers the single most significant potential improvements in lift drag ratio (L/D) of all the aerodynamic technologies under consideration. The F-16XL Supersonic Laminar Flow Control (SLFC) Experiment was conceived based on the encouraging results of in-house and NASA supported industry studies to determine if laminar flow control is feasible for the HSCT. The primary objective is to achieve extensive laminar flow (50-60 percent chord) on a highly swept supersonic wing. Data obtained from the flight test will be used to validate existing Euler and Navier Stokes aerodynamic codes and transition prediction boundary layer stability codes. These validated codes and developed design methodology will be delivered to industry for their use in designing supersonic laminar flow control wings. Results from this experiment will establish preliminary suction system design criteria enabling industry to better size

the suction system and develop improved estimates of system weight, fuel volume loss due to wing ducting, turbocompressor power requirements, etc. so that benefits and penalties can be more accurately assessed.
Derived from text

N94-33526*# Douglas Aircraft Co., Inc., Long Beach, CA.
SUPERSONIC LFC: CHALLENGES AND OPPORTUNITIES
Arthur G. Powell *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1823-1840 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The discussion and viewgraphs on supersonic laminar control are provided. The high fuel fractions required for long range supersonic airplanes give significant leverage to technologies for cruise drag reduction such as laminar flow control (LFC). Fuel burn benefits are further enhanced when sizing effects are considered. These effects may even be powerful enough to reduce airplane production cost over a turbulent baseline. This is an important goal for LFC technology development. The results of aerodynamics studies on the application of LFC technology to the highly swept wings of supersonic airplanes are presented. Important questions of applicability, realistic benefit, and critical application issues, addressed in a NASA-sponsored study conducted by McDonnell Douglas Corporation in 1987-88 are reviewed. Efforts aimed at establishing the feasibility of demonstrating extensive laminarization on the F-16XL-2 airplane are summarized. Derived from text

N94-33527*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.
STATUS OF F16XL SSLFC NUMERICAL DESIGN VALIDATION
Mike George (Rockwell International Corp., Los Angeles, CA.), Marta Bohn-Meyer, and Bianca Anderson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1843-1889 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs and discussion of the status of the F-16XL SSLFC numerical design validation are provided. The F-16XL Supersonic Laminar Flow Control Program (SSLFC) is a joint effort involving Rockwell's North American Aircraft Division, NASA Ames-Dryden Flight Research Facility, and NASA Langley Research Center. The objectives of the program are to demonstrate that laminar flow can be obtained on a highly swept wing at supersonic speeds, validate the capabilities of a numerical methodology designed to predict boundary layer transition, and validate the capabilities of the methodology in the design of active and passive laminar flow control (LFC) concepts. The F-16XL SSLFC Program consists of the design, fabrication, installation, and flight test of an active laminar flow control glove for the F-16XL. The glove design emphasized the active (suction) control of attachment line and crossflow boundary condition instabilities. The glove design envelop was constrained by the existing geometry, safety of flight considerations, and space requirements for the suction mechanism. The leading edge extension of the glove was limited to 10 inches for consideration of asymmetric flying qualities and the glove height above the existing surface restricted to two inches. The active (suction) portion of the wing extends to nominally 25 percent chord. The glove was constructed of a micro-perforated titanium sheet (hole diameter = 0.025 inches, spacing ratio = 1/8, and sheet thickness = 0.0025 inches). The glove design includes 22 separate chambers to allow suction variation in the chordwise direction. The F-16XL SSLFC program is currently in the flight test phase.
Derived from text

N94-33528*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CODE VALIDATION FOR THE SIMULATION OF SUPERSONIC VISCOUS FLOW ABOUT THE F-16XL
Jolen Flores, Eugene Tu, and Lyndell King *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1893-1908 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs and discussion on code validation for the simulation of supersonic viscous flow about the F-16XL are provided. Because of the large potential gains related to laminar flow on the swept wings of supersonic aircraft, interest in the applications of laminar flow control (LFC) techniques in the supersonic regime has increased. A supersonic laminar flow control (SLFC) technology program is currently underway within NASA. The objective of this program is to develop the data base and design methods that are critical to the development of laminar flow control technology for application to supersonic transport aircraft design. Towards this end, the program integrates computational investigations underway at NASA Ames-Moffett and NASA Langley with flight-test investigations being conducted on the F-16XL at the NASA Ames-Dryden Research Facility in cooperation with Rockwell International. The computational goal at NASA Ames-Moffett is to integrate a thin-layer Reynolds averaged Navier-Stokes flow solver with a stability analysis code. The flow solver would provide boundary layer profiles to the stability analysis code which in turn would predict transition on the F-16XL wing. To utilize the stability analysis codes, reliable boundary layer data is necessary at off-design cases. Previously, much of the prediction of boundary layer transition has been accomplished through the coupling of boundary layer codes with stability theory. However, boundary layer codes may have difficulties at high Reynolds numbers, of the order of 100 million, and with the current complex geometry in question. Therefore, a reliable code which solves the thin-layer Reynolds averaged Navier-Stokes equations is needed. Two objectives are discussed, the first in greater depth. The first objective is method verification, via comparisons of computations with experiment, of the reliability and robustness of the code. To successfully implement LFC techniques to the F-16XL wing, the flow about the leading edge must be maintained as laminar flow. Therefore, the second objective is to focus on a series of numerical simulations with different values of angle of attack, alpha, and Reynolds numbers. The purpose of the simulations is to study their effects on the two main factors which precipitate transition to turbulence at leading edges of highly swept wings (e.g., 'spanwise contamination' and 'crossflow instability').
Derived from text

N94-33529*# Vigyan Research Associates, Inc., Hampton, VA.
INVISCID AND VISCOUS FLOW CALCULATIONS FOR THE F16XL CONFIGURATION
Venkit Iyer *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1911-1973 (For primary document see N94-33517 10-02)
Avail: CASI HC A04/MF A04

The viewgraphs and discussion of the ongoing activity at NASA Langley Research Center (LaRC) in support of Supersonic Laminar FLow Control (SLFC) research, presented at the High-Speed Research Workshop, May 14-16, 1991, are provided. Details of the computation involved in obtaining the meanflow around bodies in high-speed flow and interfacing the results to a stablilty analysis is presented. Particular attention is given to the F-16XL configuration, which is the test-bed for the supersonic LFC experiment. Meanflow solutions for two geometries are discussed. The first one is for the F-16XL wing, with emphasis on the flow near the attachment line and the upper surface. Calculations were done with and without suction. The results were processed using an interface program and fed into a stability analysis program. The second geometry is a scale model of a swept wing leading edge at M = 3.5. Experimental measurements on transition on this model are planned at NASA LaRC. The computations are in support of this effort. Derived from text

N94-33530*# High Technology Corp., Hampton, VA.
LINEAR STABILITY THEORY AND THREE-DIMENSIONAL BOUNDARY LAYER TRANSITION
Robert E. Spall and Mujeeb R. Malik *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 1977-1999 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs and discussion of linear stability theory and three dimensional boundary layer transition are provided. The ability to predict, using analytical tools, the location of boundary layer transition over aircraft-type configurations is of great importance to designers interested in laminar flow control (LFC). The e(sup N) method has proven to be fairly effective in predicting, in a consistent manner, the location of the onset of transition for simple geometries in low disturbance environments. This method provides a correlation between the most amplified single normal mode and the experimental location of the onset of transition. Studies indicate that values of N between 8 and 10 correlate well with the onset of transition. For most previous calculations, the mean flows were restricted to two-dimensional or axisymmetric cases, or have employed simple

three-dimensional mean flows (e.g., rotating disk, infinite swept wing, or tapered swept wing with straight isobars). Unfortunately, for flows over general wing configurations, and for nearly all flows over fuselage-type bodies at incidence, the analysis of fully three-dimensional flow fields is required. Results obtained for the linear stability of fully three-dimensional boundary layers formed over both wing and fuselage-type geometries, and for both high and low speed flows are discussed. When possible, transition estimates form the e(sup N) method are compared to experimentally determined locations. The stability calculations are made using a modified version of the linear stability code COSAL. Mean flows were computed using both Navier Stokes and boundary-layer codes. Derived from text

N94-33531*# Boeing Commercial Airplane Co., Seattle, WA.
SUPERSONIC HLFC: POTENTIAL BENEFITS AND TECHNOLOGY DEVELOPMENT REQUIREMENTS
Frank Neumann *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 4 Apr. 1992 p 2003-2047 (For primary document see N94-33517 10-02)
Avail: CASI HC A03/MF A04

The viewgraphs and discussion of the potential benefits and technology development requirements of supersonic Hybrid Laminar Flow Control (HLFC) are reviewed. For the last three years, Boeing has performed studies on the application of laminar flow control to High Speed Civil Transport (HSCT) configurations. Large potential net benefits were identified for laminar flow control, even after accounting for the significant implementation penalties. However, the technical risks are high at this time, and an early, aggressive technology development program is required if laminar flow control (LFC) is to be incorporated in a year 2005 HSCT program. The benefits and required development effort are addressed. Of all the aerodynamic advances that are being considered for the HSCT, LFC has the largest potential for improving the supersonic lift drag ratio of a given configuration. The work accomplished to date, sponsored by NASA Langley, is summarized. This work includes studies on HLFC application to HSCT, cruise HLFC/low speed boundary layer control (BLC) compatibility, and impact of M 0.9 HLFC and high lift BLC. Requirements for production committments are listed. The need for a HSCT-HLFC Risk Reduction Program is addressed. Supersonic HLFC development planning and future applications are addressed. Laminar flow/high-lift integration is addressed.
Derived from text

N94-33705*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ICING TEST RESULTS ON AN ADVANCED TWO-DIMENSIONAL HIGH-LIFT MULTI-ELEMENT AIRFOIL
Jaiwon Shin, Peter Wilcox, Vincent Chin, and David Sheldon Jun. 1994 22 p Presented at the 12th Applied Aerodynamics Conference, Colorado Springs, CO, 20-22 Jun. 1994; sponsored by AIAA
(RTOP 505-68-10)
(NASA-TM-106620; E-8906; NAS 1.15:106620; AIAA Paper 94-1869)
Avail: CASI HC A03/MF A01

An experimental study has been conducted to investigate ice accretions on a high-lift, multi-element airfoil in the Icing Research Tunnel at the NASA Lewis Research Center. The airfoil is representative of an advanced transport wing design. The experimental work was conducted as part of a cooperative program between McDonnell Douglas Aerospace and the NASA Lewis Research Center to improve current understanding of ice accretion characteristics on the multi-element airfoil. The experimental effort also provided ice shapes for future aerodynamic tests at flight Reynolds numbers to ascertain high-lift performance effects. Ice shapes documented for a landing configuration over a variety of icing conditions are presented along with analyses. Author

N94-33782# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
A SHOCK TUBE STUDY OF AERODYNAMIC HEATING OF GAPS IN A CYLINDER SUBJECTED TO SUPERSONIC CROSS FLOW M.S. Thesis
Douglas D. High Mar. 1994 265 p
(AD-A278550; AFIT/GA/ENY/94M-2) Avail: CASI HC A12/MF A03

The effects of localized aerodynamic heating in cylinder expansion gaps positioned in cross flow were investigated in a shock tube. For this study, Mach number and Reynolds number were varied from 1.04 to 1.38 and 5 x 10(exp 5) to 9 x 10(exp 5), respectively. The cylinder was instrumented with quick response time thermocouples positioned on the surface of the cylinder, the wall of the gap, and the gap floor. Gap aspect ratios varied from 1.23 to 3.69. Pressure gauges were used to measure wave shock speeds, pressure ratios, and transient pressure conditions. Surface temperatures were measured and converted to heat fluxes using a one-dimensional semi-infinite slab model. Adiabatic wall temperatures were obtained from pressure measurements and ideal gas law relationships. Local nondimensional heat transfer coefficients, Nusselt numbers, were calculated from experimental surface and adiabatic wall temperatures. The present study found a direct dependence on Nusselt number values with Mach number. Peak heating inside the gap was determined to be a function of gap width and location on the cylinder. As gap width was reduced, the location of peak heating on the cylinder varied and Nusselt number values on the floor of the gap dominated. DTIC

N94-33835 Naval Postgraduate School, Monterey, CA.
CYLINDER DRAG EXPERIMENT: AN UPGRADED LABORATORY M.S. Thesis
Clayton W. Miller Dec. 1993 111 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277841) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A generalized, automated, data acquisition system was designed for the Naval Postgraduate School Aerolab Low Speed Wind Tunnel. A specific application of this system was to upgrade the current Cylinder Drag Experiment conducted during AA2801 Aero Laboratories 1, an introductory aeronautical laboratory course taught at the Naval Postgraduate School. Two methods of drag determination were used: pressure distribution and wake analysis (momentum method). Data from these two methods were collected by a system based on a high speed analog/digital computer board, a standard 486 IBM-type PC, and data acquisition software. Characteristic methods of reducing data from this experiment are discussed. The results obtained by analyzing the acquired data compared favorably to empirical data from previous circular cylinder coefficient of drag experiments. This automated data acquisition system will facilitate future research and instructional use of the wind tunnel. DTIC

N94-33898*# Rockwell International Corp., Huntsville, AL. Space Systems Div.
NUMERICAL SIMULATION OF THE EDGE TONE PHENOMENON Final Report
N. S. Dougherty, B. L. Liu, and J. M. OFarrell Washington Feb. 1994 71 p Original contains color illustrations
(Contract NAS8-38550)
(NASA-CR-4581; M-744; NAS 1.26:4581) Avail: CASI HC A04/MF A01; 2 functional color pages

Time accurate Navier-Stokes computations were performed to study a class 2 (acoustic) whistle, the edge tone, and to gain knowledge of the vortex-acoustic coupling mechanisms driving production of these tones. Results were obtained by solving the full Navier-Stokes equations for laminar compressible air flow of a two dimensional jet issuing from a slit interacting with a wedge. Cases considered were determined by varying the distance from the slit to the wedge. Flow speed was kept constant at 1,750 cm/s as was the slit thickness of 0.1 cm, corresponding to conditions in the experiments of Brown. The analytical computations revealed edge tones to be present in four harmonic stages of jet flow instability over the wedge as the jet length was varied from 0.3 to 1.6 cm. Excellent agreement was obtained in all four edge tone stage cases between the present computational results and the experimentally obtained frequencies and flow visualization results of Brown. Specific edge tone generation phenomena and further confirmation of certain theories and empirical formulas concerning these phenomena were brought to light in this analytical simulation of edge tones. Author (revised)

N94-33966# Nielsen Engineering and Research, Inc., Mountain View, CA.
CONTROLLING COMBUSTION AND MAXIMIZING HEAT RELEASE IN A REACTING COMPRESSIBLE FREE SHEAR LAYER Final Report, 15 Dec. 1990 - 15 Dec. 1993
David Nixon and Laurence R. Keefe 11 Feb. 1994 38 p
(Contract F49620-91-C-0020)

(AD-A278328; NERI-TR-476; AFOSR-94-0167TR) Avail: CASI HC A03/MF A01

The objective of this work has been to study the interaction between heat release and mixing in compressible shear layers by analysis and computation, with an eye to finding flow configurations that maximize the heat release per unit distance in the stream direction. The principal prediction is that heat release asymmetry across the layer can enhance mixing over the non-heat release case, but the effect appears too small to yield practical benefits at this time. Time dependent, three-dimensional numerical simulations of a shear layer with weak, steady heat release have shown that such heat release need not decrease mixing but the expected increases are also absent, or too small to be detected currently. However, the original non-heat-release theory has been successfully extended to predict the mixing behavior of three-dimensional planar layers and round compressible jets. This bolsters confidence in the generality of the principles underlying the analysis. Invoking a mixing maximum principle, the extended theory gives a satisfactory analytic expression for mixing ratio when M(sub c) is less than or equal to 3. A variational formulation of the heat release problem with a functional dependent on the square of streamline curvature has proved intractable. DTIC

N94-33991*# Florida Atlantic Univ., Boca Raton, FL. Dept. of Mechanical Engineering.

SENSITIVITY OF LAG-DAMPING CORRELATIONS TO STRUCTURAL AND AERODYNAMIC APPROXIMATIONS OF ISOLATED EXPERIMENTAL ROTORS IN FORWARD FLIGHT Interim Technical Report, 1 Aug. 1992 - 21 Dec. 1993

G. H. Gaonkar, S. Subramanian, and Srinivas Chunduru Apr. 1994 44 p Prepared for Army Aviation Research and Development Command, Moffett Field, CA

(Grant NAG2-797)

(NASA-CR-195822; NAS 1.26:195822) Avail: CASI HC A03/MF A01

The predictions of regressive lag-mode damping levels are correlated with the database of an isolated, soft-inplane, three-blade rotor operated untrimmed. The database was generated at the Army Aeroflightdynamics Directorate at Ames. The correlation covers a broad range of data, from near-zero thrust conditions in hover to high-thrust and highly stalled conditions in forward flight with advance ratio as high as 0.55 and shaft angle as high as 20 degrees. In the experimental rotor, the airfoil or blade portion has essentially uniform mass and stiffness distributions, but the root flexure has highly nonuniform mass and stiffness distributions. Accordingly, the structural approximations refer to four models of root-flexure-blade assembly. They range from a rigid flap-lag model to three elastic flap-lag-torsion models, which differ in modeling the root flexure. The three models of root-flexure are: three root springs in which the bending-torsion couplings are fully accounted for; a finite-length beam element with some average mass and stiffness distributions such that the fundamental frequencies match those of the experimental model; and accurate modal representation in which the actual mass and stiffness distributions of the experimental root-flexure-blade assembly are used in calculating the nonrotating mode shapes. The four models of root-flexure-blade assembly are referred to as the rigid flap-lag model, spring model, modified model and modal model. For each of these four models of the root-flexure-blade assembly, the predictions are based on the following five aerodynamic theories: ear theory, which accounts for large angle-of-attack and reverse-flow effects on lift, and has constant drag and pitching moment; quasisteady stall theory, which includes quasisteady stall lift, drag and pitching moment characteristics of the airfoil section, dynamics stall theory, which uses the ONERA dynamic stall models of lift, drag and pitching moment; dynamic wake theory, which is based on a finite-state three-dimensional wake model and includes all wake effects including both shed and trailing vorticity; and dynamics and wake theory, which combines both dynamic stall theory and dynamic wake theory and is a relatively complete aerodynamic representation. Derived from text

N94-33995*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.

FURTHER DEVELOPMENT AND FLIGHT TEST OF AN AUTONOMOUS PRECISION LANDING SYSTEM USING A PARAFOIL

James E. Murray, Alex G. Sim, David C. Neufeld, Patrick K. Rennich, Stephen R. Norris, and Wesley S. Hughes Jul. 1994 12 p Presented at the 6th Biennial Flight Test Conference, Colorado Springs, CO, 20-23 Jun. 1994

(RTOP 505-68-50)

(NASA-TM-4599; H-1987; NAS 1.15:4599; AIAA Paper 94-2141) Avail: CASI HC A03/MF A01

NASA Dryden Flight Research Center and NASA Johnson Space Center are jointly conducting a phased program to determine the feasibility of the autonomous recovery of a spacecraft using a ram-air parafoil system for the final stages of entry from space to a precision landing. The feasibility is being studied using a flight model of a spacecraft in the generic shape of a flattened biconic that weighs approximately 120 lb and is flown under a commercially available ram-air parafoil. Key components of the vehicle include the global positioning system (GPS) guidance for navigation, a flight control computer, an electronic compass, a yaw rate gyro, and an onboard data recorder. A flight test program is being used to develop and refine the vehicle. The primary flight goal is to demonstrate autonomous flight from an altitude of 3,000 m (10,000 ft) with a lateral offset of 1.6 km (1.0 mi) to a precision soft landing. This paper summarizes the progress to date. Much of the navigation system has been tested, including a heading tracker that was developed using parameter estimation techniques and a complementary filter. The autoland portion of the autopilot is still in development. The feasibility of conducting the flare maneuver without servoactuators was investigated as a means of significantly reducing the servoactuator rate and load requirements. Author (revised)

N94-33997*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

NASA AMES FLUID MECHANICS LABORATORY RESEARCH BRIEFS

Sanford Davis, ed. May 1994 24 p

(RTOP 505-59-50)

(NASA-TM-108818; A-94073; NAS 1.15:108818) Avail: CASI HC A03/MF A01

The Ames Fluid Mechanics Laboratory research program is presented in a series of research briefs. Nineteen projects covering aeronautical fluid mechanics and related areas are discussed and augmented with the publication and presentation output of the Branch for the period 1990-1993. Author

N94-34159# JAI Associates, Inc., Mountain View, CA.

A FREE-WAKE EULER AND NAVIER-STOKES CFD METHOD AND ITS APPLICATION TO HELICOPTER ROTORS INCLUDING DYNAMIC STALL Final Report, Apr. 1990 - Nov. 1993

Ganapathi R. Srinivasan Nov. 1993 119 p

(Contract DAAL03-90-C-0013)

(AD-A278000; TR-93-01) Avail: CASI HC A06/MF A02

This report summarizes the results of the research in two parts. Part 1 describes the development and application of a free-wake Euler and Navier-Stokes computational fluid dynamics method, called TURNS, for helicopter applications. This finite-difference, implicit, upwind numerical method uses structured grids, and has been used for calculating the viscous, three-dimensional flowfields of rotors in hover, forward flight, blade-vortex interactions, and high speed impulsive noise. The good agreement of numerical results with experiments for surface pressures, wake trajectory, thrust, power, figure of merit, and acoustic wave forms indicate the accuracy and suitability of the numerical method. It is demonstrated that both aerodynamics and acoustics information can be obtained in a single solution of the governing equations. In Part 2, the unsteady flowfield results of a two-dimensional oscillating wing are presented for five widely used turbulence models and compared with experiments. The accuracy and suitability of turbulence models for unsteady separated flow are discussed. DTIC

N94-34172*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

STATIC PERFORMANCE INVESTIGATION OF A SKEWED-THROAT MULTIAXIS THRUST-VECTORING NOZZLE CONCEPT

David J. Wing Apr. 1994 126 p

(RTOP 505-62-30-01)

(NASA-TP-3411; L-17271; NAS 1.60:3411) Avail: CASI HC A07/MF A02

The static performance of a jet exhaust nozzle which achieves multiaxis thrust vectoring by physically skewing the geometric throat has been characterized in the static test facility of the 16-Foot Transonic Tunnel at NASA Langley Research Center. The nozzle has an asymmetric internal

geometry defined by four surfaces: a convergent-divergent upper surface with its ridge perpendicular to the nozzle centerline, a convergent-divergent lower surface with its ridge skewed relative to the nozzle centerline, an outwardly deflected sidewall, and a straight sidewall. The primary goal of the concept is to provide efficient yaw thrust vectoring by forcing the sonic plane (nozzle throat) to form at a yaw angle defined by the skewed ridge of the lower surface contour. A secondary goal is to provide multiaxis thrust vectoring by combining the skewed-throat yaw-vectoring concept with upper and lower pitch flap deflections. The geometric parameters varied in this investigation included lower surface ridge skew angle, nozzle expansion ratio (divergence angle), aspect ratio, pitch flap deflection angle, and sidewall deflection angle. Nozzle pressure ratio was varied from 2 to a high of 11.5 for some configurations. The results of the investigation indicate that efficient, substantial multiaxis thrust vectoring was achieved by the skewed-throat nozzle concept. However, certain control surface deflections destabilized the internal flow field, which resulted in substantial shifts in the position and orientation of the sonic plane and had an adverse effect on thrust-vectoring and weight flow characteristics. By increasing the expansion ratio, the location of the sonic plane was stabilized. The asymmetric design resulted in interdependent pitch and yaw thrust vectoring as well as nonzero thrust-vector angles with undeflected control surfaces. By skewing the ridges of both the upper and lower surface contours, the interdependency between pitch and yaw thrust vectoring may be eliminated and the location of the sonic plane may be further stabilized. Author

N94-34204*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

THIRD-ORDER 2N-STORAGE RUNGE-KUTTA SCHEMES WITH ERROR CONTROL

Mark H. Carpenter and Christopher A. Kennedy Jun. 1994 17 p
(RTOP 505-70-62-13)
(NASA-TM-109111; NAS 1.15:109111) Avail: CASI HC A03/MF A01

A family of four-stage third-order explicit Runge-Kutta schemes is derived that requires only two storage locations and has desirable stability characteristics. Error control is achieved by embedding a second-order scheme within the four-stage procedure. Certain schemes are identified that are as efficient and accurate as conventional embedded schemes of comparable order and require fewer storage locations. Author

N94-34207*# Virginia Polytechnic Inst., Blacksburg, VA. Aerospace and Ocean Engineering Dept.

FLOW STRUCTURE GENERATED BY PERPENDICULAR BLADE VORTEX INTERACTION AND IMPLICATIONS FOR HELICOPTER NOISE PREDICTIONS Semiannual Report, 19 Oct. 1993 - 19 Apr. 1994

William J. Devenport and Stewart A. L. Glegg 1994 5 p
(Grant NAG1-1539)
(NASA-CR-195824; NAS 1.26:195824) Avail: CASI HC A01/MF A01

Activities carried out in support of research on flow structure generated by perpendicular blade vortex interaction and implications for helicopter noise prediction are summarized. Progress in the following areas is described: (1) construction of 8 inch-chord NACA 0012 full-span blade; (2) Acquisition of two full-span blades; (3) preparation for hot wire measurements; (4) related work on a modified Betz's theory; and (5) work related to helicopter noise prediction. In addition, a list of publications based on the results of prior experimentation is presented. CASI

N94-34277*# MCAT Inst., San Jose, CA.

COMPUTATIONAL STUDY OF GENERIC HYPERSONIC VEHICLE FLOW FIELDS Final Report

Johnny R. Narayan Apr. 1994 70 p Original contains color illustrations
(Contract NCC2-715)
(NASA-CR-195938; NAS 1.26:195938; MCAT-94-03) Avail: CASI HC A04/MF A01; 9 functional color pages

The geometric data of the generic hypersonic vehicle configuration included body definitions and preliminary grids for the forebody (nose cone excluded), midsection (propulsion system excluded), and afterbody sections. This data was to be augmented by the nose section geometry (blunt conical section mated with the noncircular cross section of the forebody initial plane) along with a grid and a detailed supersonic combustion ramjet (scramjet) geometry (inlet and combustor) which should be merged with the nozzle portion of the afterbody geometry. The solutions were to be obtained by using a Navier-Stokes (NS) code such as TUFF for the nose portion, a parabolized Navier-Stokes (PNS) solver such as the UPS and STUFF codes for the forebody, a NS solver with finite rate hydrogen-air chemistry capability such as TUFF and SPARK for the scramjet and a suitable solver (NS or PNS) for the afterbody and external nozzle flows. The numerical simulation of the hypersonic propulsion system for the generic hypersonic vehicle is the major focus of this entire work. Supersonic combustion ramjet is such a propulsion system, hence the main thrust of the present task has been to establish a solution procedure for the scramjet flow. The scramjet flow is compressible, turbulent, and reacting. The fuel used is hydrogen and the combustion process proceeds at a finite rate. As a result, the solution procedure must be capable of addressing such flows. Derived from text

N94-34384*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

X-29 FLIGHT CONTROL SYSTEM: LESSONS LEARNED

Robert Clarke, John J. Burken, John T. Bosworth, and Jeffery E. Bauer Jun. 1994 17 p Presented at the AGARD Flight Mechanics Panel Symposium, Turin, Italy, 9-12 May 1994
(RTOP 505-64-30)
(NASA-TM-4598; H-1995; NAS 1.15:4598) Avail: CASI HC A03/MF A01

Two X-29A aircraft were flown at the NASA Dryden Flight Research Center over a period of eight years. The airplanes' unique features are the forward-swept wing, variable incidence close-coupled canard and highly relaxed longitudinal static stability (up to 35-percent negative static margin at subsonic conditions). This paper describes the primary flight control system and significant modifications made to this system, flight test techniques used during envelope expansion, and results for the low- and high-angle-of-attack programs. Through out the paper, lessons learned will be discussed to illustrate the problems associated with the implementation of complex flight control systems. Author

N94-34391*# Akron Univ., OH. Dept. of Mechanical Engineering.

A QUALITATIVE AND QUANTITATIVE LASER-BASED COMPUTER-AIDED FLOW VISUALIZATION METHOD M.S. Thesis, 1992 Final Report

Victor A. Canacci and M. Jack Braun May 1994 205 p
(Contracts NCC3-93; NCC3-165; RTOP 505-62-52)
(NASA-CR-195300; E-8692; NAS 1.26:195300) Avail: CASI HC A10/MF A03

The experimental approach presented here offers a nonintrusive, qualitative and quantitative evaluation of full field flow patterns applicable in various geometries in a variety of fluids. This Full Flow Field Tracking (FFFT) Particle Image Velocimetry (PIV) technique, by means of particle tracers illuminated by a laser light sheet, offers an alternative to Laser Doppler Velocimetry (LDV), and intrusive systems such as Hot Wire/Film Anemometry. The method makes obtainable the flow patterns, and allows quantitative determination of the velocities, accelerations, and mass flows of an entire flow field. The method uses a computer based digitizing system attached through an imaging board to a low luminosity camera. A customized optical train allows the system to become a long distance microscope (LDM), allowing magnifications of areas of interest ranging up to 100 times. Presented in addition to the method itself, are studies in which the flow patterns and velocities were observed and evaluated in three distinct geometries, with three different working fluids. The first study involved pressure and flow analysis of a brush seal in oil. The next application involved studying the velocity and flow patterns in a cowl lip cooling passage of an air breathing aircraft engine using water as the working fluid. Finally, the method was extended to a study in air to examine the flows in a staggered pin arrangement located on one side of a branched duct. Author

N94-34430*# Eidetics International, Inc., Torrance, CA.

F/A-18 FOREBODY VORTEX CONTROL. VOLUME 2: ROTARY-BALANCE TESTS

Brian R. Kramer, Carlos J. Suarez, Gerald N. Malcolm, and Bert F. Ayers Mar. 1994 217 p
(Contract NAS2-13383)
(NASA-CR-4582; A-94055; NAS 1.26:4582) Avail: CASI HC A10/MF A03

A rotary-balance wind tunnel test was conducted on a six percent model of the F/A-18 at the NASA Ames 7 X 10-Foot Low Speed Wind Tunnel. The data reduction was specially written for the test in National Instruments' LabVIEW. The data acquisition, reduction and analysis was performed with a Macintosh computer. The primary objective of the test was to evaluate the effectiveness of several forebody vortex control configurations in a rotary flow field. The devices that were found to be the most effective during the static tests (Volume 1) were investigated and included both mechanical and pneumatic configurations. The mechanical systems evaluated were small, single and dual, rotating nose tip strakes and a vertical nose strake. The jet blowing configuration used nozzles canted inboard 60 degrees. A two segment tangential slot was also evaluated. The different techniques were evaluated at angles of attack of 30 degrees, 45 degrees, 51 degrees, and 60 degrees. Sideslip and Reynolds number were varied for some of the configurations. All of the techniques proved to be effective in the rotating flow field. The vertical nose strake had the largest 'envelope' of effectiveness. Forebody vortex control provides large, robust yawing moments at medium to high angles of attack, even during combat maneuvers such as loaded roll. Author

N94-34704*# Rice Univ., Houston, TX.
ANALYSIS OF WAVELET TECHNOLOGY FOR NASA APPLICATIONS Final Report
R. O. Wells, Jr. 31 May 1994 19 p
(Grant NAG9-681)
(NASA-CR-195929; NAS 1.26:195929) Avail: CASI HC A03/MF A01

The purpose of this grant was to introduce a broad group of NASA researchers and administrators to wavelet technology and to determine its future role in research and development at NASA JSC. The activities of several briefings held between NASA JSC scientists and Rice University researchers are discussed. An attached paper, 'Recent Advances in Wavelet Technology', summarizes some aspects of these briefings. Two proposals submitted to NASA reflect the primary areas of common interest. They are image analysis and numerical solutions of partial differential equations arising in computational fluid dynamics and structural mechanics. CASI

N94-34948*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AN EXAMINATION OF THE AERODYNAMIC MOMENT ON ROTOR BLADE TIPS USING FLIGHT TEST DATA AND ANALYSIS
Thomas H. Maier and William G. Bousman Oct. 1993 20 p See also A94-12064
(RTOP 505-59-52)
(NASA-TM-104006; A-93047; NAS 1.15:104006; USAATCOM-TR-92-A-014) Avail: CASI HC A03/MF A01

The analysis CAMRAD/JA is used to model two aircraft, a Puma with a swept-tip blade and a UH-60A Black Hawk. The accuracy of the analysis in predicting the torsion loads is assessed by comparing the predicted loads with measurements from flight tests. The influence of assumptions in the analytical model is examined by varying model parameters and comparing the predicted results to baseline values for the torsion loads. Flight test data from a research Puma are used to identify the source of torsion loads. These data indicate that the aerodynamic section moment in the region of the blade tip dominates torsion loading in high-speed flight. Both the aerodynamic section moment at the blade tip and the pitch-link loads are characterized by large positive (nose-up) moments in the first quadrant with rapid reversal of load so that the moment is negative in the second quadrant. Both the character and magnitude of this loading are missed by the CAMRAD/JA analysis. Author

N94-34964*# Calspan-State Univ. of New York Joint Venture, Buffalo, NY. Research Center.
EXPERIMENTAL STUDIES OF SHOCK-WAVE/WALL-JET INTERACTION IN HYPERSONIC FLOW, PART A Final Report
Michael S. Holden and Kathleen Rodriguez May 1994 226 p
(Grant NAG1-790)
(NASA-CR-195957; NAS 1.26:195957) Avail: CASI HC A11/MF A03

Experimental studies have been conducted to examine slot film cooling effectiveness and the interaction between the cooling film and an incident planar shock wave in turbulent hypersonic flow. The experimental studies were conducted in the 48-inch shock tunnel at Calspan at a freestream Mach number of close to 6.4 and at a Reynolds number of 35 x 10(exp 6) based on the length of the model at the injection point. The Mach 2.3 planar wall jet was generated from 40 transverse nozzles (with heights of both 0.080 inch and 0.120 inch), producing a film that extended the full width of the model. The nozzles were operated at pressures and velocities close to matching the freestream, as well as at conditions where the nozzle flows were over- and under-expanded. A two-dimensional shock generator was used to generate oblique shocks that deflected the flow through total turnings of 11, 16, and 21 degrees; the flows impinged downstream of the nozzle exits. Detailed measurements of heat transfer and pressure were made both ahead and downstream of the injection station, with the greatest concentration of measurements in the regions of shock-wave/boundary layer interaction. The major objectives of these experimental studies were to explore the effectiveness of film cooling in the presence of regions of shock-wave/boundary layer interaction and, more specifically, to determine how boundary layer separation and the large recompression heating rates were modified by film cooling. Detailed distributions of heat transfer and pressure were obtained in the incident-shock/wall-jet interaction region for a series of shock strengths and impingement positions for each of the two nozzle heights. Measurements were also made to examine the effects of nozzle lip thickness on cooling effectiveness. The major conclusion from these studies was that the effect of the cooling film could be readily dispersed by relatively weak incident shocks, so the peak heating in the recompression region was not significantly reduced by even the largest levels of film cooling. For the case studies in the absence of film cooling, the interaction regions were unseparated. However, adding film cooling resulted in regions of boundary layer separation induced in the film cooling layer, the size of which regions first increased and then decreased with increased film cooling. Surprisingly, the size of the separated regions and the magnitude of the recompression heating were not strongly influenced by the thickness of the cooling film, nor by the point of shock impingement relative to the exit plane of the nozzles. The lip thickness was found to have little effect on cooling effectiveness. Measurements with and in the absence of shock interaction were compared with the results of earlier experimental studies and correlated in terms of the major parameters controlling these flows. Author

N94-34965*# Calspan-State Univ. of New York Joint Venture, Buffalo, NY. Research Center.
EXPERIMENTAL STUDIES OF TRANSPIRATION COOLING WITH SHOCK INTERACTION IN HYPERSONIC FLOW, PART B Final Report
Michael S. Holden May 1994 267 p
(Grant NAG1-790)
(NASA-CR-195958; NAS 1.26:195958) Avail: CASI HC A12/MF A03

This report describes the result of experimental studies conducted to examine the effects of the impingement of an oblique shock on the flowfield and surface characteristics of a transpiration-cooled wall in turbulent hypersonic flow. The principal objective of this work was to determine whether the interaction between the oblique shock and the low-momentum region of the transpiration-cooled boundary layer created a highly distorted flowfield and resulted in a significant reduction in the cooling effectiveness of the transpiration-cooled surface. As a part of this program, we also sought to determine the effectiveness of transpiration cooling with nitrogen and helium injectants for a wide range of blowing rates under constant-pressure conditions in the absence of shock interaction. This experimental program was conducted in the Calspan 48-Inch Shock Tunnel at nominal Mach numbers of 6 and 8, for a Reynolds number of 7.5 x 10(exp 6). For these test conditions, we obtained fully turbulent boundary layers upstream of the interaction regions over the transpiration-cooled segment of the flat plate. The experimental program was conducted in two phases. In the first phase, we examined the effects of mass-addition level and coolant properties on the cooling effectiveness of transpiration-cooled surfaces in the absence of shock interaction. In the second phase of the program, we examined the effects of oblique shock impingement on the flowfield and surface characteristics of a transpiration-cooled surface. The studies were conducted for a range of shock strengths with nitrogen and helium coolants to examine how the distribution of heat transfer and pressure and the characteristics of the flowfield in the interaction region varied with shock strength and the level of mass addition from the transpiration-cooled section of the model. The effects of the distribution of the blowing rate along the interaction regions were also examined for a range of blowing rates through the transpiration-cooled panels. The regions of

shockwave/boundary layer interaction examined in these studies were induced by oblique shocks generated with a sharp, flat plate, inclined to the freestream at angles of 5 degrees, 7.5 degrees, and 10 degrees. It was found that, in the absence of an incident shock, transpiration cooling was a very effective method for reducing both the heat transfer and the skin friction loads on the surface. The helium coolant was found to be significantly more effective than nitrogen, because of its low molecular weight and high specific heat. The studies of shock-wave/transpiration-cooled surface interaction demonstrated that the interaction region between the incident shock and the low-momentum transpiration-cooled boundary layer did not result in a significant increase in the size of attached or separated interaction regions, and did not result in significant flowfield distortions above the interaction region. The increase in heating downstream of the shock-impingement point could easily be reduced to the values without shock impingement by a relatively small increase in the transpiration cooling in this region. Surprisingly, this increase in cooling rate did not result in a significant increase in size of the region ahead of the incident shock or create a significantly enlarged interaction region with a resultant increase in the distortion level in the inviscid flow. Thus, transpiration cooling appears to be a very effective technique to cool the internal surfaces of scramjet engines, where shocks in the engine would induce large local increases in wall heating and create viscous/inviscid interactions that could significantly disturb the smooth flow through the combustor. However, if hydrogen is used as the coolant, burning upstream of shock impingement might result in localized hot spots. Clearly, further research is needed in this area. Author

N94-34612# Dassault Aviation, Saint-Cloud (France).
HIGH INCIDENCE FLOW ANALYSIS OVER THE RAFALE A [ANALYSE THEORIQUE DE L'ECOULEMENT AUTOUR D'UN RAFALE A A GRANDE INCIDENCE]
Jean-Denis Marion *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 7 p In FRENCH (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

N94-34967*# United Technologies Corp., East Hartford, CT.
UNSTEADY SEPARATION EXPERIMENTS ON 2-D AIRFOILS, 3-D WINGS, AND MODEL HELICOPTER ROTORS
Peter F. Lorber and Franklin O. Carta *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 1-22 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34969*# Florida Agricultural and Mechanical Univ., Tallahassee, FL. Coll. of Engineering.
UNSTEADY FLOW PAST AN AIRFOIL PITCHED AT CONSTANT RATE
L. Lourenco, L. VanDommelen, C. Shib, and A. Krothapalli *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 35-59 Sponsored by AFOSR Prepared in cooperation with Florida State Univ., Tallahassee (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34970*# University of Southern California, Los Angeles, CA. Dept. of Aerospace Engineering.
UNSTEADY SEPARATION PROCESS AND VORTICITY BALANCE ON UNSTEADY AIRFOILS
Chih-Ming Ho, Ismet Gursul, Chiang Shih, and Hank Lin *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 61-77 (For primary document see N94-34966 10-34)
(Contract F49620-88-C-0061)
Avail: CASI HC A03/MF A03

N94-34971*# Lehigh Univ., Bethlehem, PA.
CONTROL OF LEADING-EDGE VORTICES ON A DELTA WING
C. Magness, O. Robinson, and D. Rockwell *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 79-100 Sponsored by AFOSR (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34972*# Illinois Inst. of Tech., Chicago, IL. Fluid Dynamics Research Center.
THE UNSTEADY PRESSURE FIELD AND VORTICITY PRODUCTIION AT THE SUCTION SURFACE OF A PITCHING AIRFOIL
Mukund Acharya and Metwally H. Metwally *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 101-118 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34974*# Cincinnati Univ., OH. Dept. of Aerospace Engineering and Engineering Mechanics.
CHARACTERIZATION OF DYNAMIC STALL PHENOMENON USING TWO-DIMENSIONAL UNSTEADY NAVIER-STOKES EQUATIONS
K. N. Ghia, U. Ghia, and G. A. Osswald *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 129-147 (For primary document see N94-34966 10-34)
(Grants AF-AFOSR-0074-87; AF-AFOSR-0249-90)
Avail: CASI HC A03/MF A03

N94-34975*# Arizona Univ., Tucson, AZ.
COMPUTED UNSTEADY FLOWS OF AIRFOILS AT HIGH INCIDENCE
K.-Y. Fung, Jeffrey Currier, and S. O. Man *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 149-162 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34977*# Naval Postgraduate School, Monterey, CA. Dept. of Aeronautics and Astronautics.
COMPUTATION OF UNSTEADY FLOWS OVER AIRFOILS
J. A. Ekaterinaris and M. F. Platzer *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 177-185 Sponsored by Naval Air Systems Command (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

N94-34978*# California State Univ., Long Beach, CA. Dept. of Aerospace Engineering.
PREDICTION OF UNSTEADY AIRFOIL FLOWS AT LARGE ANGLES OF INCIDENCE
Tuncer Cebeci, H. M. Jang, and H. H. Chen *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 187-201 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34979*# Lehigh Univ., Bethlehem, PA. Dept. of Mechanical Engineering and Mechanics.
SOME ASPECTS OF UNSTEADY SEPARATION
C. R. Smith and J. D. A. Walker *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 203-208 (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

N94-34986*# Army Aviation Systems Command, Moffett Field, CA. Aeroflightdynamics Directorate.
THE QUEST FOR STALL-FREE DYNAMIC LIFT
C. Tung, K. W. McAlister, Lawrence W. Carr, E. Duque, and R. Zinner *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 277-295 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34987*# Illinois Inst. of Tech., Chicago, IL. Fluid Dynamics Research Center.
MECHANISMS OF FLOW CONTROL WITH THE UNSTEADY BLEED TECHNIQUE
D. R. Williams, M. Acharya, and J. Bernhardt *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 297-307 (For primary document see N94-34966 10-34)
(Contract F49620-86-C-0133)
Avail: CASI HC A03/MF A03

N94-34989*# Michigan State Univ., East Lansing, MI.
EFFECT OF INITIAL ACCELERATION ON THE DEVELOPMENT OF THE FLOW FIELD OF AN AIRFOIL PITCHING AT CONSTANT RATE
M. M. Koochesfahani, V. Smiljanovski, and T. A. Brown *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 317-332 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N94-33563* National Aeronautics and Space Administration, Washington, DC.
AIRLINE SAFETY AND ECONOMY (Videotape)
1993 Videotape: 6 min. 30 sec. playing time, in color, with sound
(NASA-TM-109811; NONP-VT-94-12939) Avail: CASI VHS A01/BETA A22

This video documents efforts at NASA Langley Research Center to improve safety and economy in aircraft. Featured are the cockpit weather information needs computer system, which relays real time weather information to the pilot, and efforts to improve techniques to detect structural flaws and corrosion, such as the thermal bond inspection system. CASI

N94-33749* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CRASH IMPACT SURVIVAL IN LIGHT PLANES (Videotape)
[1994] Videotape: 7 min. 45 sec. playing time, in color, with sound
(NASA-TM-109799; NONP-VT-94-12927) Avail: CASI VHS A01/BETA A22

This video explains the effects on aircraft and passengers of light plane crashes. The explanation is provided through the use of simulated light planes and dummies. CASI

N94-33943*# San Jose State Univ., CA.
ON THE DESIGN OF FLIGHT-DECK PROCEDURES
Asaf Degani and Earl L. Wiener Jun. 1994 70 p
(Contracts NCC2-327; NCC2-581)
(NASA-CR-177642; A-94095; NAS 1.26:177642) Avail: CASI HC A04/MF A01

In complex human-machine systems, operations, training, and standardization depend on a elaborate set of procedures which are specified and mandated by the operational management of the organization. The intent is to provide guidance to the pilots, to ensure a logical, efficient, safe, and predictable means of carrying out the mission objectives. In this report the authors examine the issue of procedure use and design from a broad viewpoint. The authors recommend a process which we call 'The Four P's:' philosophy, policies, procedures, and practices. We believe that if an organization commits to this process, it can create a set of procedures that are more internally consistent, less confusing, better respected by the flight crews, and that will lead to greater conformity. The 'Four-P' model, and the guidelines for procedural development in appendix 1, resulted from cockpit observations, extensive interviews with airline management and pilots, interviews and discussion at one major airframe manufacturer, and an examination of accident and incident reports. Although this report is based on airline operations, we believe that the principles may be applicable to other complex, high-risk systems, such as nuclear power production, manufacturing process control, space flight, and military operations. Author (revised)

N94-33956*# Polytechnic Univ., Farmingdale, NY. Dept. of Computer Science.
A STUDY OF OCCURRENCE RATES OF ELECTROMAGNETIC INTERFERENCE (EMI) TO AIRCRAFT WITH A FOCUS ON HIRF (EXTERNAL) HIGH INTENSITY RADIATED FIELDS Final Report
Martin L. Shooman Apr. 1994 98 p
(Grant NAG1-1272; RTOP 505-64-10)
(NASA-CR-194895; NAS 1.26:194895) Avail: CASI HC A05/MF A02

This report presents the methodology and results of a subjective study done by Polytechnic University to investigate Electromagnetic Interference (EMI) events on aircraft. The results cover various types of EMI from on-board aircraft systems, passenger carry-on devices, and externally generated disturbances. The focus of the study, however, was on externally generated EMI, termed High Intensity Radiated Fields (HIRF), from radars, radio and television transmitters, and other man-made emitters of electromagnetic energy. The study methodology used an anonymous questionnaire distributed to experts to gather the data. This method is known as the Delphi or Consensus Estimation technique. The questionnaire was sent to an expert population of 230 and there were 57 respondents. Details of the questionnaire, a few anecdotes, and the statistical results of the study are presented. Author

N94-34390# National Transportation Safety Board, Washington, DC.
AIRCRAFT ACCIDENT REPORT: CONTROLLED FLIGHT INTO TERRAIN FEDERAL AVIATION ADMINISTRATION BEECH SUPER KING AIR 300/F, N82, FRONT ROYAL, VIRGINIA, 26 OCTOBER 1993
12 Apr. 1994 111 p
(PB94-910405; NTSB/AAR-94/03) Avail: CASI HC A06/MF A02

This report explains the crash into mountainous terrain of a Beech Super King Air 300/F, N82, owned by the Federal Aviation Administration, near Front Royal, Virginia, on October 26, 1993. The safety issues discussed in the report focused on the Federal Aviation Administration's flying program operations and the flight safety management system. Recommendations concerning these issues were addressed to the Federal Aviation Administration. Author

N94-34401 Federal Aviation Administration, Washington, DC.
FEDERAL AVIATION REGULATIONS. PART 91: GENERAL OPERATING AND FLIGHT RULES, CHANGE 4
5 Oct. 1993 22 p See also PB94-159910 and PB94-105392 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-159944) Avail: CASI HC A03

This subpart prescribes flight rules governing the operation of aircraft within the United States and within 12 nautical miles from the coast of the United States. NTIS

N94-34410 Federal Aviation Administration, Washington, DC.
FEDERAL AVIATION REGULATIONS. PART 91: GENERAL OPERATING AND FLIGHT RULES, CHANGE 3
16 Sep. 1993 26 p See also PB94-159944 and PB94-105392 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-159910) Avail: CASI HC A03

This subpart prescribes flight rules governing the operation of aircraft within the United States and within 12 nautical miles from the coast of the United States. NTIS

N94-34915*# Western Aerospace Labs., Inc., Monte Sereno, CA.
EFFECTS OF CHECKLIST INTERFACE ON NON-VERBAL CREW COMMUNICATIONS
Leon D. Segal May 1994 95 p
(Contract NCC2-486)
(NASA-CR-177639; A-94079; NASD 1.26:177639) Avail: CASI HC A05/MF A01

The investigation looked at the effects of the spatial layout and functionality of cockpit displays and controls on crew communication. Specifically, the study focused on the intra-cockpit crew interaction, and subsequent task performance, of airline pilots flying different configurations of a new electronic checklist, designed and tested in a high-fidelity simulator at NASA Ames Research Center. The first part of this proposal establishes the theoretical background for the assumptions underlying the research, suggesting that in the context of the interaction between a multi-operator crew and a machine, the design and configuration of the interface will affect interactions between individual operators and the machine, and subsequently, the interaction between operators. In view of the latest trends in cockpit interface design and flight-deck technology, in particular, the centralization of displays and controls, the introduction identifies certain problems associated with these modern designs and suggests specific design issues to which the expected results could be applied. A detailed

research program and methodology is outlined and the results are described and discussed. Overall, differences in cockpit design were shown to impact the activity within the cockpit, including interactions between pilots and aircraft and the cooperative interactions between pilots. Author

N94-34991# National Transportation Safety Board, Washington, DC. Office of Research and Engineering.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA: US GENERAL AVIATION CALENDAR YEAR 1991
4 Apr. 1994 84 p
(PB94-127982; NTSB/ARG-94/01) Avail: CASI HC A05/MF A01

This report presents a statistical compilation and review of general aviation accidents which occurred in 1991 in the United States, its territories and possessions, and in international waters. The accidents reported are all those involving U.S. registered aircraft not conducting operations under 14 CFR 121, 14 CFR 125, 14 CFR 127, or 14 CFR 135. This report is divided into five sections: all accidents, fatal accidents, serious injury accidents, property damage accidents, and midair collision accidents. Several tables present accident parameters for 1991 accidents only, and each section includes tabulations which present comparative statistics for 1991 and for the five-year period 1986-1990. Author (revised)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *Communications and Radar.*

N94-33412# Federal Aviation Administration, Cambridge, MA. National Transportation Systems Center.
PILOT GPS/LORAN RECEIVER PROGRAMMING PERFORMANCE: A LABORATORY EVALUATION Final Report, May 1992 - Sep. 1993
Edwin F. Madigan, Jr., Vicki M. Shearer, Donald Eldredge, and M. S. Huntley, Jr. Feb. 1994 103 p
(AD-A278258; DOT-VNTSC-FAA-93-20) Avail: CASI HC A06/MF A02

This study was designed to explore GPS/LORAN receiver programming performance under simulated flight conditions. The programming task consisted of entering, editing, and verifying a four-waypoint flight plan. The task demands were manipulated by varying flight turbulence and the time interval between test sessions. Flight performance data indicated that subjects were well trained on the flight task; significant effects of turbulence and test interval were not found. Programming performance was very good and critical errors occurred on only 13% of the test trials. Examination of the conditions surrounding each error indicated that specific display design and system logic attributes contributed to the errors. In addition, examination of error recovery methods showed that non-intuitive menu structures complicated and confused the recovery process. Pilots rarely recalled 'doing anything wrong' when errors occurred, suggesting that the receiver interface design was opaque and did not provide a good understanding of system function. Recommendations for GPS/LORAN receiver controls, functions, menu structure and logic, error recognition and recovery, and general usability are discussed. DTIC

N94-33534*# Scripps Institution of Oceanography, La Jolla, CA.
PERMANENT GPS GEODETIC ARRAY IN SOUTHERN CALIFORNIA (PGGA) AND GPS OBSERVATIONS IN INDONESIA Final Technical Report, 1 Oct. 1990 - 31 Mar. 1993
Yehuds Bock 18 May 1994 6 p
(Grant NAGw-2641)
(NASA-CR-195897; NAS 1.26:195897) Avail: CASI HC A02/MF A01

The Permanent GPS Geodetic Array (PGGA) is a network of permanent monitoring GPS stations in southern California devoted to the continuous measurement of crustal deformation in near real-time. The PGGA plays a unique role in studies of the kinematics of crustal deformation and the earthquake cycle in southern California because it is also providing temporally dense geodetic measurements of crustal motion over periods of minutes to variations in regional crustal strain. As it expands and matures the PGGA will play an increasingly important role in the study of active tectonics of southern California by bridging the frequency range between seismology, observatory geodesy, paleoseismology, and geology. In Indonesia GPS data is used for measurement of a large scale crustal deformation, extending from north China to the Indonesian archipelago. Indonesia offers a tremendous laboratory to study some of the processes that build continents, and mountains are active there. We began GPS observations in August 1989 on mainland Sumatra and the Mentawai Islands to study the phenomena of oblique plate convergence. We have analyzed the Indonesian data in conjunction with data collected on Christmas and Cocos Islands and at Darwin, Australia, and with the triangulation data in Sumatra.
Derived from text

N94-34093# National Defence Research Establishment, Linkoeping (Sweden). Huvudavdelning foer Informationsteknologi.
ALGORITHMS FOR A DIGITAL RADIO DIRECTION FINDING SYSTEM IN THE HF BAND
T. B. Johansson and H. T. Johansson Dec. 1993 51 p
(PB94-149176; FOA-C-30738-3.6) Avail: CASI HC A04/MF A01

The report presents an overview of methods for radio direction finding in the HF band, including phase difference to amplitude (Adcock) systems, interferometers, and pseudo-Doppler systems. Most of the work is concentrated on the Adcock technique which is to be included in an operational system under construction. Estimation algorithms to determine the angle of arrival for an eight-element Adcock array are described and improvements for the reduction of approximation errors are suggested. Furthermore, routines for time averaging the incoming data and calibration are presented to increase the system performance. Finally, results from simulations of the developed algorithms are given. NTIS

N94-34113# Technische Univ., Delft (Netherlands). Sectie Mathematische Geodesie en Puntsbepaling.
DIFFERENTIAL GPS POSITIONING: DGPS MODELLING USING PSEUDO RANGE OBSERVATIONS
J. Hussem Aug. 1993 207 p See also PB93-221299
(PB94-149697) Avail: CASI HC A10/MF A03

Proper stochastic and functional modeling of pseudo ranges is essential for the use of quality control parameters. This thesis is concerned with the verification of the commonly used pseudo range stochastical and functional models. At five different baselines a large number of pseudo range observations has been performed. Some empirical results from these measurements are checked against their theoretical expectations. The following comparisons have been made: empirical positions/baselines against known positions/baselines; empirical and theoretical variances/covariances; empirical and theoretical distributions of positions, w-tests and F-tests; time correlation of pseudo range observations, positions and w-tests (modeling assumes no time correlation present). The measurements have been performed at five known baselines, ranging from 3 meters up to 200 km. The relation between baseline length and the above comparisons has been investigated. NTIS

N94-34026*# George Washington Univ., Washington, DC. Dept. of Electrical Engineering and Computer Science.
A STUDY OF NAVIGATION IN VIRTUAL SPACE
Rudy Darken, John L. Sibert, and Randy Shumaker *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 51-60
(For primary document see N94-34019 10-99)
(Contract N00014-91-K-2031)
Avail: CASI HC A02/MF A04

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles see *85 Urban Technology and Transportation*.

N94-33536*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

EFFECTIVE DECLUTTER OF COMPLEX FLIGHT DISPLAYS USING STEREOPTIC 3-D CUEING

Russell V. Parrish, Steven P. Williams, and Dean E. Nold Apr. 1994 25 p

(RTOP 505-64-53-03; DA Proj. 1L1-62211-AH-85)

(NASA-TP-3426; L-17308; NAS 1.60:3426; CECOM-TR-93-B-E-3) Avail: CASI HC A03/MF A01

The application of stereo technology to new, integrated pictorial display formats has been effective in situational awareness enhancements, and stereo has been postulated to be effective for the declutter of complex informational displays. This paper reports a full-factorial workstation experiment performed to verify the potential benefits of stereo cueing for the declutter function in a simulated tracking task. The experimental symbology was designed similar to that of a conventional flight director, although the format was an intentionally confused presentation that resulted in a very cluttered dynamic display. The subject's task was to use a hand controller to keep a tracking symbol, an 'X', on top of a target symbol, another X, which was being randomly driven. In the basic tracking task, both the target symbol and the tracking symbol were presented as red X's. The presence of color coding was used to provide some declutter, thus making the task more reasonable to perform. For this condition, the target symbol was coded red, and the tracking symbol was coded blue. Noise conditions, or additional clutter, were provided by the inclusion of randomly moving, differently colored X symbols. Stereo depth, which was hypothesized to declutter the display, was utilized by placing any noise in a plane in front of the display monitor, the tracking symbol at screen depth, and the target symbol behind the screen. The results from analyzing the performances of eight subjects revealed that the stereo presentation effectively offsets the cluttering effects of both the noise and the absence of color coding. The potential of stereo cueing to declutter complex informational displays has therefore been verified; this ability to declutter is an additional benefit from the application of stereoptic cueing to pictorial flight displays. Author

N94-33565* National Aeronautics and Space Administration, Washington, DC.

PERSEUS: GLOBAL WATCHER (Videotape)

1993 Videotape: 7 min. playing time, in color, with sound

(NASA-TM-109813; NONP-VT-94-12941) Avail: CASI VHS A01/BETA A22

This video documents efforts of NASA Dryden Flight Research Center to develop and utilize ultra-light, remotely piloted gliders to study Earth's atmosphere. The advantage of these vehicles is that they are inexpensive, and can fly at altitudes twice that of commercial airlines. CASI

N94-33790* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

STOVL (Videotape)

Jan. 1990 Videotape: 4 min. 43 sec. playing time, in color, with sound

(NASA-TM-109845; Rept-4003; NONP-VT-94-13535) Avail: CASI VHS A01/BETA A22

This video examines research and applications of the STOVL aircraft. CASI

N94-33875# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.

OPERATIONAL AGILITY [LA MANIABILITE OPERATIONNELLE]

Apr. 1994 222 p

(AGARD-AR-314; ISBN-92-835-0743-6) Copyright Avail: CASI HC A10/MF A03

From previous AGARD activities, it was recognized that flying qualities and traditional aircraft performance parameters did not characterize the capability or effectiveness of combat aircraft, although they do offer a guide. Other expert groups had reached a similar conclusion. The subject that arose from these realizations was 'agility'. Recognizing that this was an incomplete or immature concept and that a wide variety of sometimes disparate views existed, the Flight Mechanics Panel formed a further Working Group, WG 19, consisting of specialists from AGARD member countries, to study the subject under the title of 'Operational Agility'. Working sessions were held at places of special interest to the group, between 1991 and 1993. The specific aims of the Working Group were to provide definitions, which are universally acceptable, of the terminologies involved in agility; to collate the results of lessons learned from experiments on agility; to define metrics or figures of merit for use in design and evaluation; to explore and document the theoretical foundations; to explore the operational pay-off of balanced capabilities between the airframe, systems and weapons; to highlight any specialized aspects applicable to rotorcraft; to indicate possible means of evaluation in flight; and to recommend areas for further research and development activities, including possible collaborative projects. The Group has completed its study of operational agility with this report. In undertaking the study, a greater understanding has been reached of those subjects which influence operational agility and how these subjects, via the use of operational agility concepts, may be related to the combat effectiveness of the weapon systems. In reaching this understanding, the Group has proposed definitions of the agility terminology which should prove universally acceptable; it has arrived at the methodology for assessment of the various component systems which contribute to the operational agility or combat effectiveness of a Weapon System; and has listed a number of major conclusions and recommendations. Author

N94-33900*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

MULTILEVEL DECOMPOSITION APPROACH TO INTEGRATED AERODYNAMIC/DYNAMIC/STRUCTURAL OPTIMIZATION OF HELICOPTER ROTOR BLADES

Joanne L. Walsh, Katherine C. Young, Jocelyn I. Pritchard, Howard M. Adelman, and Wayne R. Mantay May 1994 26 p Presented at the AHS Aeromechanics Specialists Conference, San Francisco, CA, 19-21 Jan. 1994

(RTOP 505-63-36-06)

(NASA-TM-109084; NAS 1.15:109084; ARL-TR-476) Avail: CASI HC A03/MF A01

This paper describes an integrated aerodynamic, dynamic, and structural (IADS) optimization procedure for helicopter rotor blades. The procedure combines performance, dynamics, and structural analyses with a general purpose optimizer using multilevel decomposition techniques. At the upper level, the structure is defined in terms of local quantities (stiffnesses, mass, and average strains). At the lower level, the structure is defined in terms of local quantities (detailed dimensions of the blade structure and stresses). The IADS procedure provides an optimization technique that is compatible with industrial design practices in which the aerodynamic and dynamic design is performed at a global level and the structural design is carried out at a detailed level with considerable dialogue and compromise among the aerodynamic, dynamic, and structural groups. The IADS procedure is demonstrated for several cases. Author

N94-34080 Army Aeromedical Research Lab., Fort Rucker, AL.

PERFORMANCE DEMONSTRATION: UH-60Q EXTERNAL RESCUE HOIST AND CARGO LOADMETER

James E. Bruckart and Joseph R. Licina Jan. 1994 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A277533; USAARL-94-6) Avail: CASI HC A03

The UH-60Q prototype MEDEVAC Black Hawk is configured to provide day/night, adverse weather, emergency movement of patients. The objective of this report is to describe the results of capability demonstrations for operating the external rescue hoist and cargo hook. The external rescue hoist is electrically operated and includes a digital indication of the cable payout. Hoist operations were accomplished with manikins in Stokes and Skedco litters. External cargo loading operations were completed lifting a 1200-lb external load. External hoist and cargo load operations can be completed in the prototype aircraft with a typical MEDEVAC Black Hawk crew. The hoist operator is not able to operate the hoist from the crew seat. He has to push the litter clear of the aircraft tire and pull the weight

of the litter aft to load it into the aircraft. The external cargo loading procedures essentially are unchanged with the addition of the cargo loadmeter. The aircraft crew stated that the loadmeter provided valuable information on the status of the external load. DTIC

N94-34106 National Defence Research Establishment, Stockholm (Sweden). Dept. of Weapon Systems, Effects and Protection.
KINEMATIC MODEL OF A BEAM RIDING AIR-TO-AIR MISSILE [KINEMATISK MODELL FOER KOLLIMATIONSSTYRD JAKTROBOT, METODRAPPORT]
E. Svensson Nov. 1993 30 p In SWEDISH
(PB94-149085; FOA-C-20939-8.4) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report gives a kinematic model of a beam rider air to air missile. The model is three-dimensional and generic. The model has been used to generate launch envelopes to compare moving firing platforms with not moving firing platforms. The results show that both the inner and the outer boundary are moving out from the center, comparing a moving firing platform with a fixed one. This depends on higher missile velocity in the first case. We can, however, not know if this results in increasing or decreasing launching area without further investigation. The report also contains an implementation of the model, written in Matlab. The launch envelopes were generated on a Macintosh Quadra 800. NTIS

N94-34118*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
VEHICLE INTEGRATION EFFECTS ON HYPERSONIC WAVERIDERS M.S. Thesis - George Washington Univ.
Charles Edward Cockrell, Jr. 21 Apr. 1994 132 p
(NASA-TM-109739; NAS 1.15:109739) Avail: CASI HC A07/MF A02

The integration of a class of hypersonic high-lift configurations known as waveriders into hypersonic cruise vehicles was evaluated. Waveriders offer advantages in aerodynamic performance and propulsion/airframe integration (PAI) characteristics over conventional hypersonic shapes. A wind-tunnel model was developed which integrates realistic vehicle components with two waverider shapes, referred to as the 'straight-wing' and 'cranked-wing' shapes. Both shapes were conical-flow-derived waveriders at a design Mach number of 4.0. The cranked-wing shape was designed to provide advantages in subsonic performance and directional stability over conventional waveriders. Experimental data and limited computational fluid dynamics (CFD) predictions were obtained over a Mach number range of 2.3 to 4.63 at a Reynolds number of 2.0x10(exp 6) per foot. The CFD predictions and flow visualization data confirmed the shock attachment characteristics of the baseline waverider shapes and illustrated the waverider flow-field properties. Both CFD predictions and experimental data showed that no significant performance degradations occur at off-design Mach numbers for the waverider shapes and the integrated configurations. The experimental data showed that the effects of adding a realistic canopy were minimal. The effects of adding engine components were to increase the drag and thus degrade the aerodynamic performance of the configuration. A significant degradation in aerodynamic performance was observed when 0 degree control surfaces were added to close the blunt base of the waverider to a sharp trailing edge. A comparison of the fully-integrated waverider models to the baseline shapes showed that the performance was significantly degraded when all of the components were added to the waveriders. The fully-integrated configurations studied here do not offer significant performance advantages over conventional hypersonic vehicles, but still offer advantages in air-breathing propulsion integration. Additionally, areas are identified in this study where improvements could be made to enhance the performance. Both fully-integrated configurations are longitudinally unstable over the Mach number range studied for unpowered conditions. The cranked-wing fully-integrated configuration provided significantly better lateral-directional stability characteristics than the straight-wing configuration. Author

N94-34128 National Defence Research Establishment, Stockholm (Sweden). Dept. of Weapon Systems, Effects and Protection.
INSTALLATION OF AN FTIR SPECTROMETER IN THE TP86 SABRELINER [INSTALLATION AV FTIR-SPEKTROMETER I TP86 SABRELINER]
C. Nelsson Sep. 1993 25 p In SWEDISH
(PB94-149036; FOA-A-30086-8.3,3.1) Avail: Issuing Activity (National Technical Information Service (NTIS))

To be able to spectrally determine the IR signature of aircraft and flares under realistic conditions an FTIR spectrometer has been installed in a TP86 Sabreliner at FMV. The report contains a description of the installation and of the preparation work with a focus on the equipment from FOA. The measurement procedure and experiences from FOA's point of view are also included. NTIS

N94-34605# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.
TECHNOLOGIES FOR HIGHLY MANOEUVRABLE AIRCRAFT [LES TECHNOLOGIES POUR LES AERONEFS A HAUTE MANOEUVRABILITE]
Mar. 1994 339 p In ENGLISH and FRENCH Symposium held in Annapolis, MD, 18-21 Oct. 1993
(AGARD-CP-548; ISBN-92-835-0740-1) Copyright Avail: CASI HC A15/MF A03

The new generation of combat aircraft incorporate significant advances in maneuver capability, especially in such areas as post-stall control and sustained supersonic maneuver. These technologies expand the operational capabilities, and are essential for survival in a sophisticated threat scenario, and also to obtain favorable exchange ratios against an opponent using the current generation of fighters. The aim of this symposium was to review the various technologies, which combine to give this increased operational capability, and the techniques which are available or being developed, to overcome the design problems associated with the attainment of these goals. The symposium was divided into six sessions covering propulsion and integrated flight control, aerodynamics and control at high angles of attack, post-stall flight and control, flying qualities applied criteria, agility and simulation. For individual titles, see N94-34606 through N94-34631.

N94-34606# Calspan Corp., Arnold AFS, TN.
USAF/AEDC AERODYNAMIC AND PROPULSION GROUND TEST AND EVALUATION TECHNIQUES FOR HIGHLY MANEUVERABLE AIRCRAFT: CAPABILITIES AND CHALLENGES
Edward M. Kraft, Glen R. Lazalier, and M. L. Laster *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 15 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A03/MF A03

The simulation of highly agile aircraft during the development phase presents a significant challenge to aerodynamic and propulsion ground test and evaluation methodologies. The primary simulation challenges are caused by the inherent unsteady, separated nature of the flow phenomena associated with maneuvering aircraft that cause dynamic effects on the airframe and engine. In general, ground test techniques are quasi-steady and transient effects are represented by linearized superposition of steady-state data and unsteady small disturbances. Current trends in the design of tactical fighter aircraft require close coupling between the airframe, avionics, and propulsion systems. In addition, the extreme attitudes and high angular rate motions of this new breed of vehicle causes a strong nonlinear coupling between components. In the current paper, several aerodynamic and propulsion ground test and evaluation methodologies applicable to maneuvering aircraft are summarized, challenges associated with current techniques are identified, and an emerging integrated test and evaluation concept that can significantly impact the quality, time, and cost of developing a new flight vehicle is introduced. Author

N94-34607# Wright Lab., Wright-Patterson AFB, OH. Turbine Engine Div.
PROGRESS AND PURPOSE OF IHPTET PROGRAM **c07**
Richard J. Hill *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

IHPTET is the Integrated High Performance Turbine Engine Technology initiative. This paper discusses the purpose (background goals and applications) and the progress of IHPTET. IHPTET is 30 percent complete and achieving significant success in advancing turbine engine technology levels. The future of IHPTET is bright. IHPTET developed technologies are being applied to both military and commercial turbine engines -- both new

engines and fleet modernization's. IHPTET is the technology base for all future military systems and the springboard for many new commercial engines. Author

N94-34608# Rolls-Royce Ltd., Bristol (England).
ENGINE CHARACTERISTICS FOR AGILE AIRCRAFT **c07**
K. R. Garwood, G. S. Hodges, and H. E. Rogers *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

A number of different factors drive and constrain the development of future technology. This paper looks at the current perspective on the development of agile aircraft systems and more specifically, the engine characteristics these demand. Having identified the desirable engine characteristics, the key technologies required to enable them are discussed. It is proposed that the optimum agile aircraft system will be achieved given these technologies by considering the best way in which the engine should be 'rated' to fulfill the operational requirements envisaged. Author

N94-34609# British Aerospace Defence Ltd., Warton (England). Aerodynamics Dept.
DESIGN OF INTEGRATED FLIGHT AND POWERPLANT CONTROL SYSTEMS
C. Fielding *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 12 p (For primary document see N94-34605 10-05)
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This paper describes the work being undertaken by British Aerospace on both of these projects, as a continuation of the flight control and technology demonstration research successfully completed on earlier projects such as the Jaguar Fly-By-Wire and the Experimental Aircraft Programme (EAP). Derived from text

N94-34610# Lockheed Advanced Development Co., Palmdale, CA. Flight Test Branch.
THRUST VECTOR AIDED MANEUVERING OF THE YF-22 ADVANCED TACTICAL FIGHTER PROTOTYPE
Robert W. Barham *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 14 p (For primary document see N94-34605 10-05)
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In the mid 1980s design work began on the U.S. Air Force's next generation air superiority fighter. The F-22 team, consisting of Lockheed, Boeing, and General Dynamics, embraced a design philosophy in which low observable technology, maneuverability, and supersonic performance were given equal consideration. Even with low observable features and long range weapon employment capabilities, the team believed that the probabilities of brief, short range air combat engagements, based on historical precedents and postulated future scenarios, demanded a highly agile design. Thrust vectoring emerged as a key feature for obtaining the desired agility without adversely impacting the aircraft's low observable signature. Thrust vectoring technology was incorporated and flown in the YF-22 Advanced Tactical Fighter prototype to investigate and validate the concept for the production F-22. The airframe, flight control system, and propulsion system were fully integrated. Thrust vectoring commands were generated by the aircraft's flight control computers and sent to each engine controller. Each engine controller independently performed the computations and issued the commands necessary to position the nozzle actuators to the correct vector angle while maintaining commanded thrust levels and engine stall margin. Flight tests showed that thrust vectoring provided major improvements in low speed maneuverability, enhanced handling qualities during tracking, and increased supersonic sustained turn performance as compared to current front line fighters. Author

N94-34611# Wright Lab., Wright-Patterson AFB, OH.
RESULTS FROM THE STOL AND MANEUVER TECHNOLOGY DEMONSTRATION PROGRAM
David J. Moorhouse *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
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The S/MTD program has generated flight test data to validate four specific technologies: 2-D thrust vectoring & reversing nozzle; integrated flight/propulsion control; advanced pilot/vehicle interface including autonomous landing guidance; and rough field/high sink rate landing gear. These technologies have been integrated into an F-15B to provide mission benefits across the complete flight envelope from on-board guidance to a bad weather short landing, through significantly enhanced maneuvering benefits to supersonic performance. These technologies are either transitioning on to other aircraft, or can be considered viable design options for future aircraft. Derived from text

N94-34612# Dassault Aviation, Saint-Cloud (France).
HIGH INCIDENCE FLOW ANALYSIS OVER THE RAFALE A [ANALYSE THEORIQUE DE L'ECOULEMENT AUTOUR D'UN RAFALE A A GRANDE INCIDENCE] **c02**
Jean-Denis Marion *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 7 p In FRENCH (For primary document see N94-34605 10-05)
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A good high angle of attack (AoA) behavior is a requisite for any new combat aircraft. In order to gain a better knowledge of the flow at high AoA, computation over the 'RAFALE A' has been conducted. The aircraft is in a full nose down controls configuration: low speed, low altitude, high AoA, and large control surfaces deflection. Moreover, slideslip is considered so as to assess the lateral behavior of the aircraft in this high AoA regime. The computational domain around the complete aircraft is discretized into an unstructured mesh and the flow is computed with a 3D inviscid (Euler) approach in finite elements. Aerodynamic coefficients have been analyzed together with the topology of the flow in these high AoA configurations. Results have been found to yield a promising agreement concerning the flow features (loss of weathercock stability at high AoA) although absolute values of coefficients are still beyond reach of this basic methodology. In an attempt to get insight into nonsymmetric flow as it can be found experimentally at high AoA, a modification of the boundary conditions which create a source of vorticity has been implemented. This leads to the existence of large amplitude side forces agreeing with experiments. Author (revised)

N94-34613# Defence Research Agency, Farnborough (England). Aerodynamics and Propulsion Dept.
DYNAMIC TESTS TO DEMONSTRATE LATERAL CONTROL USING FOREBODY SUCTION ON LARGE SCALE MODELS IN THE DRA 24 FOOT WIND TUNNEL **c09**
Geraldine F. Edwards, A. Jean Ross, Edward B. Jefferies, and Charles O. OLeary *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 14 p (For primary document see N94-34605 10-05)
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The concept of applying suction at the nose of forebodies at high angles of attack to control the vortex flow was tested in two dynamic wind-tunnel experiments on large scale versions of the Defence Research Agency (DRA) High Incidence Research Model (HIRM1) in the DRA 24ft wind tunnel. The first experiment with a HIRM1 wind tunnel model mounted on a free-to-yaw rig used an analog control system. The model was controlled at angles of attack of 28 degrees and 32.5 degrees by applying differential suction through small holes near the nose apex to minimize the error between demanded and measured angle of sideslip. The second experiment used a free-flight version of HIRM1 with a digital Departure Prevention System (DPS) which was flown successfully in previous experiments. A nose suction control law, designed to maintain roll about the wind axis, was added to the DPS. The model was mounted on a rig which allowed freedom in yaw, roll, and pitch, the tailplanes could move symmetrically and differentially, and the rudder was used to augment directional stability. The model could be flown at angles of attack up to about 30 degrees, with the suction control law active, but would diverge in yaw and roll if the suction was turned off. Author (revised)

N94-34614# Institut de Mecanique des Fluides de Marseille (France).
TECHNIQUES FOR AERODYNAMIC CHARACTERIZATION AND PERFORMANCE EVALUATION AT HIGH ANGLE OF ATTACK [OUTILS POUR LA CARACTERISATION AERODYNAMIQUE ET L'EVALUATION DES PERFORMANCES A HAUTE INCIDENCE]
O. Renier *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 13 p In FRENCH (For primary document see N94-34605

10-05)
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ONERA-IMFL develops techniques for high AOA maneuvering aircraft behavior studies. Specific wind-tunnels test coning and oscillatory coning motions, and constant pitch rate tests provide information about steady and unsteady, low speed aerodynamics. Specific software facilitates data analysis and aerodynamic modelling. Application of nonlinear dynamic systems analysis techniques allows stabilities calculations and performance evaluation. For some maneuvers, behavior predictions can be validated with model flight tests in vertical wind-tunnel or in laboratory. These techniques have been used for forebody yaw control studies. Sensitivity of strakes efficiency to aircraft dynamic motions was measured in wind-tunnel facilities. Model flight tests confirm expected behaviors. Author (revised)

N94-34615# Bath Univ. (England). School of Mechanical Engineering.
YAW CONTROL BY TANGENTIAL FOREBODY BLOWING **c08**
N. J. Wood and W. J. Crowther *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 10 p (For primary document see N94-34605 10-05)
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Aircraft yaw control at high angles of attack by tangential forebody blowing has been investigated experimentally. Tests were performed in the University of Bath 2.1 m X 2.5 m low speed wind tunnel using an approximately 6 percent scale generic combat aircraft model fitted with blowing slots in the nose cone. Six component strain gauge balance force and moment data was measured for angles of attack up to 90 degrees for various slot geometries and locations. The effect of slot azimuthal location is demonstrated and a slot stall phenomenon described. A geometry dependent forebody/wing flow-field coupling has been identified which can lead to unexpected yawing and rolling moments. The primary source of yawing moment is shown to be the enhanced area of attached flow on the blown side of the forebody rather than direct vortex influence. The optimum slot extent and location depend on the angle of attack range over which control is required. For regions where steady vortex asymmetry is present, slots near the apex of the forebody produce severe control reversals at low blowing rates which can be minimized by placing the slots away from the apex. For control in regions where the flow is dominated by periodic vortex shedding, long slots offer efficient control to 90 degree angle of attack. The most suitable compromise for wide range control would appear to be a short slot placed away from the apex of the forebody. Author (revised)

N94-34616# Defence Research Agency, Bedford (England).
CONTROL OF LEADING-EDGE SEPARATION ON A CAMBERED DELTA WING **c08**
P. R. Ashill and G. L. Riddle *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 13 p (For primary document see N94-34605 10-05)
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Wind tunnel studies of flows over a cambered delta wing of 60 degrees leading-edge sweep at low speed have shown that the flow separates on a forward part of the curved upper surface. Although not apparent in surface pressure distributions, this separation strongly influences the position of the onset of leading-edge separation. The present paper describes a wind-tunnel study into the use of sub boundary-layer vortex generators, in the form of thin wires, to control the flow along and toward the upper-surface separation line. The control is effective because it shifts the position of the onset of leading-edge separation downstream, ensuring increased leading-edge thrust, mainly through a reorganization of the separated flow further downstream. The flow mechanisms are described, as well as the effects of wire number. Multiple wires can provide a reduction of about 16% in the lift-dependent drag factor. The implications of the study for the subsonic flight characteristics of supersonic combat aircraft are described and suggest that the vortex generators offer genuine improvements in subsonic maneuver performance. Author (revised)

N94-34617# Tsentralni Aerogidrodinamicheskii Inst., Moscow (USSR).
AERODYNAMIC DESIGN OF SUPER MANEUVERABLE AIRCRAFT
R. D. Irodov and A. V. Petrov *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 6 p (For primary document see N94-34605 10-05)
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The main peculiarities of aerodynamic design of highly maneuverable aircraft are examined. The possibilities of improving the aerodynamic characteristics of aircraft at high angles of attack by use of high-lift devices and powered-lift systems (boundary layer control, blowing over wing, engine thrust vectoring) are shown. The conditions of controllable maneuver at high post-stalled angles of attack (alpha is less than or equal to 90 degrees) are established. Results of experimental investigations on the influence of wing planform and locations of aircraft components (wing, empennage) on the longitudinal stability and controllability at high angles of attack are presented. A comparative analysis of aerodynamic and maneuver performance of aircraft of various configurations (conventional, three-surface, canard) is performed. Author (revised)

N94-34618# Deutsche Aerospace A.G., Munich (Germany). Military Aircraft Group.
X-31A CONTROL LAW DESIGN **c08**
H. Beh and G. Hofinger *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 9 p (For primary document see N94-34605 10-05)
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Tbis paper presents an overview on the X-31A flight control law design philosophy and the technical realization of the design. After an introduction to the FCS hardware configuration, the basic control law structure and the method used for feedback gain calculation are presented. Several elements, such as the feedforward path, gravity effect compensation, inertial and gyroscopic coupling compensation, and the pilot command system, are discussed in more detail. Simplified block diagrams of the basic flight control mode in the longitudinal and lateral/directional axis follow. Finally, the implementation of the thrust vectoring system including engagement and disengagement procedure is shown. Author (revised)

N94-34619# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugmechanik.
X-31A SYSTEM IDENTIFICATION APPLIED TO POST-STALL FLIGHT: AERODYNAMICS AND THRUST VECTORING **c08**
D. Rohlf, E. Plastschke, and S. Weiss *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 12 p (For primary document see N94-34605 10-05)
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Flight testing of the X-31A post-stall experimental aircraft started in Oct. 1990. By the end of 1992, the X-31A flight regime had been expanded to 70 deg angle of attack, and a significant number of flight tests with dynamic post-stall maneuvers had been performed. Within the international 'Combined X-31A Flight Test Team,' DLR (the German Aerospace Research Establishment) contributes its system identification experience and capabilities to the determination of aerodynamic parameters and thrust vector control effectiveness from flight test data. After a brief description of the applied hardware and software, this paper presents recent results from flight test data compatibility checking. The identification models used for the separated evaluation of longitudinal and lateral-directional motion are introduced. This emphasizes the model reductions necessary for X-31A high angle of attack applications. Identification results of selected aerodynamic parameters are shown in comparison to wind-tunnel predictions. The identification of the X-31A thrust vector control effectiveness is addressed, and preliminary results are presented as well. An overview of future identification activities with respect to nonlinear/instationary effects in the high angle of attack regime is given. Author (revised)

N94-34620# Naval Air Warfare Center, Patuxent River, MD. Strike Aircraft Test Directorate.
X-31 TACTICAL UTILITY: INITIAL RESULTS
David E. Canter and Allen W. Groves *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 15 p (For primary document see N94-34605 10-05)
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The X-31 is a research aircraft built to explore the tactical benefits of the enhanced fighter maneuverability that is possible through the use of thrust vectoring. This paper gives background information on the program and on the aircraft. The high angle of attack envelope expansion phase is covered. This section details aircraft modifications that were required. The tactical utility phase of testing, including simulation and flight testing, is

discussed. Helmet mounted display and supersonic thrust vectoring tests planned for the near future are briefly discussed. Author (revised)

N94-34621# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. of Flight Mechanics.

EFA FLYING QUALITIES SPECIFICATION AND ITS UTILISATION

M. Marchand, R. Koehler, H. Duda, E. Buchacker, and K. Elbel *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 18 p (For primary document see N94-34605 10-05)

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The European Fighter Aircraft (EFA) was designed as a highly augmented, basically unstable aircraft. Its Stability and Control System (FCS) is of a much higher complexity than that used in earlier aircraft, e.g., the Tornado. To ensure that safe operation and optimum performance are not degraded due to possible handling quality deficiencies, new methods had to be used for both the development and the assessment of the aircraft. This paper describes the specifications and the methods used in customer assessment prior to first flight. An overview of these methods is provided. Author (revised)

N94-34622# Naval Air Warfare Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.

APPLICATION OF CURRENT DEPARTURE RESISTANCE CRITERIA TO THE POST-STALL MANOEUVERING ENVELOPE

Robert M. Seltzer and Jeffrey F. Calvert *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 17 p (For primary document see N94-34605 10-05)

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This paper presents an analysis of current departure resistance and high angle of attack (HAOA) flying quality parameters with respect to applicability and utility in the design and assessment of today's enhanced maneuverability aircraft. Modern fighter/attack aircraft possess extremely nonlinear aerodynamic databases and highly complex flight control systems. In addition, these aircraft require both departure resistance and mission effective HAOA maneuvering capability. The limitations of using traditional departure susceptibility parameters such as C(sub n(beta (sub DYN))) and LCDP to address departure resistance and agility design and analysis issues are analyzed and presented herein. Discussion includes the design philosophy and tradeoffs of improving static versus dynamic departure resistance. In addition, the utility of open or closed-loop departure parameters derived from linear and/or decoupled equations of motion representing highly nonlinear aircraft is addressed. Finally, a general methodology outlining the application and validity of current departure susceptibility parameters to the modern aircraft HAOA flight regime is provided with recommendations. Author (revised)

N94-34623# Wright Lab., Wright-Patterson AFB, OH. Flight Dynamics Directorate.

FLYING QUALITIES EVALUATION MANEUVERS

Thomas J. Cord, David B. Leggett, David J. Wilson, David R. Riley, and Kevin D. Citurs *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)

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An initial set of aircraft maneuvers has been defined to augment the evaluation methods currently used by the flying qualities and flight test communities. These maneuvers are meant to employ the full range of available aircraft dynamics and to be applied over the full aircraft flight envelope. They include several closed-loop tasks and are the start of a set of demonstration maneuvers (of the type now used in the rotorcraft flying quality specification) for aircraft requirements. A primary goal was to establish a tie between design parameters, aircraft attributes, and the operational usage environment while maintaining control of the evaluation process. The approach was to concentrate on aircraft dynamics which occur in daily operations and to create pilot tasks which use those conditions to relate to important aircraft characteristics. Existing evaluation methods concentrate on comparing quantitative data to charts in MIL-Standards which predict flying qualities. The maneuvers discussed here directly measure the ability of the pilot to perform the tasks of interest and at the same time maintain a tie to the design community. Author (revised)

N94-34624# Army Aviation Systems Command, Moffett Field, CA.

STUDY FINDINGS ON THE INFLUENCE OF MANEUVERABILITY AND AGILITY ON HELICOPTER HANDLING QUALITIES

Matthew S. Whalley *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 10 p (For primary document see N94-34605 10-05)

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Three piloted simulation studies were performed by the U.S. Army Aeroflightdynamics Directorate to examine the influence of maneuverability and agility on helicopter handling qualities and to provide an expanded basis for the dynamic response requirements in Aeronautical Design Standard 33C, Handling Qualities Requirements for Military Rotorcraft. The experiments focused on aggressive tasks such as air-to-air combat and target acquisition and tracking. The first experiment focused on yaw agility requirements in the form of attitude quickness and bandwidth. The second experiment focused on pitch and roll agility and maneuverability requirements in the form of bandwidth, angular rate, and attitude quickness. The third experiment focused on maneuverability requirements in the form of normal and longitudinal load factor envelope for both conventional and compound helicopters. Findings from the three studies are presented in the form of Cooper-Harper handling qualities ratings, pilot commentary, and task performance. Author

N94-34625# British Aerospace Defence Ltd., Preston (England).

OPERATIONAL AGILITY: AN OVERVIEW OF AGARD WORKING GROUP 19

K. McKay *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 11 p (For primary document see N94-34605 10-05)

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The environment in which a fighter pilot is required to operate is subject to continual change. This change arises from advances in technology and the altering world political situation. The only prediction that can be made with any confidence is that this change process is bound to continue with an unpredictable rate. In dealing with change, it is easy to prescribe a process but extremely difficult to implement the process with success. Success requires anticipation, reaction, reevaluation and modification of tactics and processes. The need for change must be recognized and accommodated. Such an approach, whether applied to fighter airplanes or any field of human endeavor, translates to agility. In undertaking this work, the group encountered many definitions of agility, some of which represented widely differing viewpoints. Often, in the past, protagonists of the varying ideas have fallen into heated arguments as to who is right. Fortunately, within the group, we have been able to stand back and examine the arguments with a dispassionate approach which has enabled us to understand the various arguments and see the common ground, rather than the differences. From our deliberations and discussions, the answer has emerged that no one was wrong, that all were right, at least in part. However, few had taken the time to stand back and take an all embracing view. Had they done so, then the message that all were trying to put forward might have had a wider and more sympathetic audience. All of the agility concepts that have been put forward have some merit. What was required was a way to relate the ideas and be able to apply them in a manner that is both reasonable and logical from both the viewpoints of the designer/supplier of aircraft and the customer/user of the vehicles that result. In defining a weapon system, it is essential to examine the component parts and their interaction, whether this be airframe, propulsion system, sensors, cockpit and avionics, or the weapons themselves and establish balance and synergistic integration between all of the components appropriate to the intended role and missions of the aircraft. It is the need to achieve balance and integration that is the prime driver for understanding operational agility as a set of concepts, supported by metrics which fit into a generalized framework, capable of evaluating a complex combat aircraft design with a view to maximizing the effectiveness of that design within affordable cost limits. The activities of the group have produced such a framework, derived from the various flight mechanics based concepts, but which would appear to be generalizable to cover the other systems, either as individual systems, or as a total weapon system. There is further work required to confirm that this framework will stand, but our initial investigations are very promising. This points the way forward for future aircraft. Achievement of this design balance requires all of the weapon system attributes to be studied, evaluated, and weighed against each other, together

with the cost implications, to determine the optimum solutions. This may imply significant compromises if the roles and perceived threats are too diverse. A consequence is that future design specifications and requirements will need to be prepared in a different way from that traditionally used.

Author (revised)

N94-34626# Alenia, Turin (Italy).

OPERATIONAL AGILITY ASSESSMENT WITH THE AM-X AIRCRAFT

Renzo Bava, Ugo Rossi, and Sergio Paloni *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 19 p (For primary document see N94-34605 10-05)

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Relating to the activities performed by WG 19 a common area of interest was individuated by Aermacchi, Alenia, and the Flight Test Center of the Italian Air Force to investigate the application of the agility concept to conventional aircraft. Agility metrics and maneuvers have been developed to evaluate the operational effectiveness of a modern fighter in the new combat scenarios that evolved following the introduction of advanced technologies. Agility metrics and maneuvers, however, may be effectively adopted to evaluate also operational effectiveness of a conventional aircraft since those metrics have been developed to reproduce synthetically the new operational scenarios. The AM-X ground attack aircraft was hence chosen as a testbed to verify the applicability of the agility concept to conventional aircraft and to assess the possible benefits for operational training. The research activity is being carried out by simulator and flight tests to compare simulator cueing effectiveness against the real A/C and to investigate simulator effectiveness for agility training. Single axis agility maneuvers performed by simulator will be validated through upcoming flight tests. Results from this activity will be used to plan and perform further simulation test with complex multiaxis closed loop agility tasks. This activity proved that agility metrics and maneuvers are applicable also to conventional A/C as well, and are effective in evaluating it within a highly dynamic combat environment. Operational agility may be improved with adequate pilot training and simulator may be used as an effective tool for it. Anyway, particular attention must be paid to the definition of the training program to overcome shortcomings of the simulator cueing system.

Author (revised)

N94-34627# Sikorsky Aircraft, Stratford, CT. Crew Station Design.

EXPANDING THE PILOT'S ENVELOPE **c54**

Bruce E. Hamilton *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 6 p (For primary document see N94-34605 10-05)

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Advances in aircraft technology have allowed the construction of fighters which can easily exceed the pilot's capability to react and to sustain G forces. Advances in avionics have allowed these airframes to be fitted with sensors, weapons, and data processors to the point that the workload associated with mission accomplishment sometimes exceeds the pilot's capabilities. Consequently, some aircraft capabilities are rarely used due to lack of familiarity. These developments highlight the fact that the ability of the aircraft to fulfill its mission is dependent upon the pilot's utilizing its capabilities as an integrated weapon system. Pilots, like airframes, have operational envelopes and expanding the pilot's envelope allows fuller exploitation of the airframe's envelope and the avionics capabilities. The nature of the pilot's envelope is presented along with attributes of a pilot interface which support expansion of the pilot's envelope.

Author (revised)

N94-34628# Defence Research Agency, Bedford (England).

THE INFLUENCE OF FLYING QUALITIES ON OPERATIONAL AGILITY

Gareth D. Padfield and John Hodgkinson *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 14 p (For primary document see N94-34605 10-05)

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Flying qualities standards are formally set to ensure safe flight and therefore to reflect minimum, rather than optimum, requirements. Agility is a flying quality but relates to operations at high, if not maximum, performance. While the quality metrics and test procedures for flying, as covered for example in MIL-STD-1797 or ADS33, may provide an adequate structure to encompass agility, they do not currently address flight at high performance. A current concern in both the fixed and rotary wing communities is the absence of substantiated agility criteria and the possible conflicts between flying qualities and high performance, i.e., more may not always be better. This paper addresses these concerns and suggests an agility factor that quantifies performance margins in flying qualities terms. The attitude quickness, from the latest rotary-wing handling requirements, provides an ideal agility measure and links handling with agility. A new parameter, based on maneuver acceleration, is introduced as a potential candidate for defining upper limits to flying qualities. These concepts are introduced within a framework aimed at unifying flying qualities and performance requirements. Finally, a probabilistic analysis of pilot handling qualities ratings is presented that suggests a powerful relationship between inherent airframe flying qualities and operational agility.

Author (revised)

N94-34629# Aerospace Engineering Test Establishment, Cold Lake (Alberta).

AN AGILITY METRIC STRUCTURE FOR OPERATIONAL AGILITY

Andrew Reif *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 15 p (For primary document see N94-34605 10-05)

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This paper summarizes how an agility metric organizational structure was developed by the Flight Mechanics Panel Working Group 19. The structure was developed from existing concepts and was generalized for application to both fixed and rotary wing aircraft. The approach was based on time domain analysis concepts focusing on the 'time to complete' a specific operational task as the primary metric. From this metric a hierarchy of smaller time scale metrics were developed to emphasize the desired transient response dependent on the mission. The metric structure was developed for organizing the concepts of airframe agility as these were the most mature. The metric scheme is comprised of transient, experimental, and operational metrics. The transient metrics were defined as those time dependent parameters that characterize instantaneous airframe state changes. Experimental metrics were defined by discrete small task elements with compound properties that were optimized for evaluation purposes but were not necessarily recognizable as a mission related maneuver. Operational metrics were defined as complete mission task elements including the total vehicle response in multiple degrees of freedom. The structure was also found to be applicable to other aspects of agility through the evolving concept of operational agility. This entailed the limited study of possible systems, pilot/vehicle interface, and weapon system time based agility metrics. Finally, the working group identified areas which required further study.

Author (revised)

N94-34630# Naval Air Warfare Center, Warminster, PA. Flight Dynamics and Controls Branch.

APPLICATION OF CENTRIFUGE BASED DYNAMIC FLIGHT SIMULATION TO ENHANCED MANEUVERABILITY RDT/E **c09**

J. F. Calvert and D. A. Kiefer *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 16 p (For primary document see N94-34605 10-05)

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This paper addresses the strengths of centrifuge simulation to provide the unfamiliar and severe motion environment associated with high angle of attack and post-stall maneuvering. The approach to development and testing of centrifuge motion control algorithms is outlined, including inherent modeling constraints such as three degrees of freedom, estimated human perceptual models, and the machine-associated mechanical/structural considerations. Difficulties of algorithm development are illustrated using the results of a recent flying qualities experiment initiated to study the effects of motion on pilot ratings for proposed nose-down control power guideline criteria. Use of off-line computer models to tune algorithm performance is also presented. Finally, current capabilities of centrifuge simulation and a discussion of future applications is outlined.

Author (revised)

N94-34631# Eidetics International, Inc., Torrance, CA.

OPTIMAL TACTICS FOR AGILE AIRCRAFT TECHNOLOGY: A DIFFERENTIAL GAME METHODOLOGY **c66**

Urban H. D. Lynch *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)

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Historically, fighter aircraft tactics were not developed until a new

aircraft reached operational use. In the past, this pilot/aircraft intensive process was affordable. In the future, budgets and limited flying time will likely necessitate a more cost-effective way to develop tactics for innovative and unfamiliar aircraft technologies. Such is the case for WVR technologies as high angle-of-attack (70 degrees) super maneuverability (X-31, F-18 HARV) and super maneuverable missiles (Archer-11, Aim-9X). The advent of very high, cost-effective computer power has made affordable optimal control techniques (that have been traditionally computationally prohibitive) and low-cost real-time piloted simulation of credible realism. Together, these two tools provide a cost-effective means to develop tactics for new technology prior to the new technology reaching the field in operational use. This paper presents the successful results of a first attempt to use Differential Games (the Eidetics AACDG) and the Eidetics low-cost ARENA simulator to develop new tactics for new technology such as extended flight maneuvering, (EFM). This work was sponsored by the Four-Power Senior National Representatives (SNR) through Aeronautical Systems-Center at Wright-Patterson Air Force Base, Ohio, USA. Author (revised)

N94-34703*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.

DEVELOPING AND FLIGHT TESTING THE HL-10 LIFTING BODY: A PRECURSOR TO THE SPACE SHUTTLE

Robert W. Kempel (PRC Kentron, Inc., Edwards, CA.), Weneth D. Painter (National Test Pilot School, Mojave, CA.), and Milton O. Thompson Apr. 1994 56 p

(RTOP 505-68-50)

(NASA-RP-1332; H-1942; NAS 1.61:1332) Avail: CASI HC A04/MF A01

The origins of the lifting-body idea are traced back to the mid-1950's, when the concept of a manned satellite reentering the Earth's atmosphere in the form of a wingless lifting body was first proposed. The advantages of low reentry deceleration loads, range capability, and horizontal landing of a lifting reentry vehicle (as compared with the high deceleration loads and parachute landing of a capsule) are presented. The evolution of the hypersonic HL-10 lifting body is reviewed from the theoretical design and development process to its selection as one of two low-speed flight vehicles for fabrication and piloted flight testing. The design, development, and flight testing of the low-speed, air-launched, rocket-powered HL-10 was part of an unprecedented NASA and contractor effort. NASA Langley Research Center conceived and developed the vehicle shape and conducted numerous theoretical, experimental, and wind-tunnel studies. NASA Flight Research Center (now NASA Dryden Flight Research Center) was responsible for final low-speed (Mach numbers less than 2.0) aerodynamic analysis, piloted simulation, control law development, and flight tests. The prime contractor, Northrop Corp., was responsible for hardware design, fabrication, and integration. Interesting and unusual events in the flight testing are presented with a review of significant problems encountered in the first flight and how they were solved. Impressions by the pilots who flew the HL-10 are included. The HL-10 completed a successful 37-flight program, achieved the highest Mach number and altitude of this class vehicle, and contributed to the technology base used to develop the space shuttle and future generations of lifting bodies. Author

N94-33448*# National Aeronautics and Space Administration, Washington, DC.

FIRST ANNUAL HSR PROGRAM WORKSHOP: HEADQUARTERS PERSPECTIVE

Robert E. Anderson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 5-23 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

N94-33449*# Boeing Commercial Airplane Co., Seattle, WA.

NASA ANNUAL HSR WORKSHOP: BOEING HSCT PROGRAM SUMMARY

Michael L. Henderson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 27-92 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

N94-33450*# Douglas Aircraft Co., Inc., Saint Louis, MO. Advanced Commercial Programs.

UPDATE ON DOUGLAS' HIGH-SPEED CIVIL TRANSPORT STUDIES

Bruce L. Bunin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 95-133 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

N94-33452*# National Aeronautics and Space Administration, Washington, DC.

HEADQUARTERS SUMMARY REPORTS

In NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 199-299 (For primary document see N94-33447 10-02)

Avail: CASI HC A05/MF A04

N94-33453*# Boeing Commercial Airplane Co., Seattle, WA.

AIRFRAME SYSTEMS STUDIES REVIEW

Frank D. Neumann *In* NASA. Langley Research Center, Forst Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 305-357 (For primary document see N94-33447 10-02)

Avail: CASI HC A04/MF A04

N94-33454*# Douglas Aircraft Co., Inc., Saint Louis, MO.

DOUGLAS AIRCRAFT HSCT STATUS AND FUTURE RESEARCH NEEDS

H. Robert Welge *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 361-384 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

N94-33455*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

HIGH-SPEED RESEARCH PROGRAM SYSTEMS ANALYSIS ACTIVITIES AT AMES RESEARCH CENTER

George H. Kidwell *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 387-419 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

N94-33456*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

OVERVIEW OF LANGLEY SYSTEMS STUDIES

Samuel D. Dollyhigh *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 423-455 (For primary document see N94-33447 10-02)

Avail: CASI HC A03/MF A04

N94-33458*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

PREVIOUS MODEL COMPARISONS Abstract Only

Charles H. Jackman *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 467-468 (For primary document see N94-33447 10-02)

Avail: CASI HC A01/MF A04

N94-33471*# Boeing Commercial Airplane Co., Seattle, WA.

HSCT DESIGN FOR REDUCED SONIC BOOM

George T. Haglund *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 703-719 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

N94-33473*# Douglas Aircraft Co., Inc., Saint Louis, MO.

SONIC BOOM CONFIGURATION MINIMIZATION

Robert A. Sohn *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 741-756 (For primary document see N94-33462 10-02)

Avail: CASI HC A03/MF A04

N94-33504*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
NACELLE-WING INTEGRATION
Gelsomina Cappuccio *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1383-1399 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33505*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT INLET DEVELOPMENT ISSUES
Joseph L. Koncsek *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1403-1421 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33506*# Douglas Aircraft Co., Inc., Long Beach, CA.
STATUS OF AN INLET CONFIGURATION TRADE STUDY FOR THE DOUGLAS HSCT
Jay R. Jones and H. Robert Welge *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1425-1436 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33508*# Lockheed Engineering and Sciences Co., Hampton, VA.
RESULTS OF A PRELIMINARY INVESTIGATION OF INLET UNSTART ON A HIGH-SPEED CIVIL TRANSPORT AIRPLANE CONCEPT
Christopher S. Domack *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1463-1479 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STATUS OF THE VARIABLE DIAMETER CENTERBODY INLET PROGRAM
John D. Saunders and A. A. Linne *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1483-1504 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-34356# Nanjing Aeronautical Inst. (China). Test and Measurement Centre.
THE MEASUREMENT AND THREE DIMENSIONAL RECONSTRUCTION FOR CONFIGURATION OF AIR VEHICLE USING IMAGE PROCESSING TECHNIQUES
Ying-En Xiong, Xin Qiao, and De-Zong Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 216-219 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34433# Rolls-Royce Ltd., Bristol (England).
HELICOPTER ENGINE/AIRFRAME INTEGRATION: THE WAY AHEAD
D. L. Mann and D. V. Humpherson *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 12 p Sponsored in part by Ministry of Defence (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

N94-34591# Aeronautical Research Inst. of Sweden, Bromma.
FATIGUE MANAGEMENT AND VERIFICATION OF AIRFRAMES
A. F. Blom and Hans Ansell *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 25 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

N94-34592# Lockheed Aeronautical Systems Co., Marietta, GA.
RISK ANALYSIS OF THE C-141 WS405 INNER-TO-OUTER WING JOINT
R. E. Alford, R. P. Bell, J. B. Cochran, and D. O. Hammond *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 10 p Presented at the Structural Integrity Program Conference, San Antonio, TX, 2-5 Dec. 1991; sponsored by USAF (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34593# Dassault-Breguet Aviation, Saint Cloud (France).
ASSESSMENT OF IN-SERVICE AIRCRAFT FATIGUE MONITORING PROCESS
R. J. Cazes *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 8 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34594# Deutsche Aerospace A.G., Munich (Germany). Military Aircraft Div.
THE ROLE OF FATIGUE ANALYSIS FOR DESIGN OF MILITARY AIRCRAFT
R. Bochmann and D. Weisgerber *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 7 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34595# Wright Lab., Wright-Patterson AFB, OH.
DAMAGE TOLERANCE MANAGEMENT OF THE X-29 VERTICAL TAIL
J. Harter *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 8 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34596# British Aerospace Defence Ltd., Farnborough (England). Military Aircraft Div.
HARRIER 2: A COMPARISON OF US AND UK APPROACHES TO FATIGUE CLEARANCE
F. S. Perry *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 27 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A01

N94-34597# British Aerospace Defence Ltd., Brough (England). Structures Unit.
FATIGUE DESIGN, TEST AND IN-SERVICE EXPERIENCE OF THE BAe HAWK
John OHara *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 10 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34598# National Aerospace Lab., Amsterdam (Netherlands).
REDUCTION OF FATIGUE LOAD EXPERIENCE AS PART OF THE FATIGUE MANAGEMENT PROGRAM FOR F-16 AIRCRAFT OF THE RNLAF
D. J. Spiekhout *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 11 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

N94-34599# Lockheed Corp., Fort Worth, TX.
AN OVERVIEW OF THE F-16 SERVICE LIFE APPROACH
J. W. Morrow and G. T. Herrick *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 9 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

N94-34968*# Naval Postgraduate School, Monterey, CA. Dept. of Aeronautics and Astronautics.
COMPARISON OF PITCH RATE HISTORY EFFECTS ON DYNAMIC STALL
M. S. Chandrasekhara, Lawrence W. Carr, and S. Ahmed *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 23-34 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

N94-34988*# Colorado Univ., Boulder, CO.
CONCEPTS AND APPLICATION OF DYNAMIC SEPARATION FOR AGILITY AND SUPER-MANEUVERABILITY OF AIRCRAFT: AN ASSESSMENT
Peter Freymuth *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 309-316 (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N94-33409# Systems and Electronics, Inc., Elk Grove Village, IL.
DESIGN, MANUFACTURE, AND TEST OF A FLIGHT LOAD RECORDER FOR SMALL AIRCRAFT Technical Note, Nov. 1992 - May 1993
C. Olkiewicz, J. Mohammadi, and J. Cicero Feb. 1994 27 p
(Contract DTRS57-92-C-00093)
(AD-A277752; SEI-249-93-03; DOT/FAA/CT-TN93/23) Avail: CASI HC A03/MF A01

This technical note covers phase 1 of a research and development effort to design, manufacture, and test a lightweight, low cost, flight load data recording system for small aircraft. The system design description (including hardware, firmware, and software), installation details, battery pack, and support brackets are presented. Discussions of the flight parameters, recording requirements of commercial aircraft, sensors needed to accommodate the flight parameters, data acquisition, and installation requirements of the sensors aboard the aircraft are covered. The research and development in Phase 2 including the environmental and vibration tests and production of the system for full implementation by the commercial aviation industry are also presented. DTIC

N94-35055*# Pennsylvania State Univ., University Park, PA. Dept. of Computer Science and Engineering.
ACCURATE ESTIMATION OF OBJECT LOCATION IN AN IMAGE SEQUENCE USING HELICOPTER FLIGHT DATA
Yuan-Liang Tang and Rangachar Kasturi *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 147-157 (For primary document see N94-35043 10-63)
(Grant NAG1-1371)
Avail: CASI HC A03/MF A03

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxilliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N94-33365 Cincinnati Univ., OH.
LASER MEASUREMENTS AND ANALYSIS OF FLOW IN A RADIAL INFLOW TURBINE INLET GUIDE VANES AND ROTOR Ph.D. Thesis
Merih Pasin 1993 235 p
Avail: Univ. Microfilms Order No. DA9319264

Detailed measurements of an unsteady flow field within the inlet guide vanes (IGV) and the rotor of a radial inflow turbine were performed using a three component laser Doppler velocimeter (LDV) system together with a rotary encoder. The mean velocity, flow angle, and the turbulence contours for IGV passages are presented at four blade-to-blade planes for different rotor positions. These results are compared with the measurements obtained in the same passage in the absence of the rotor. The flow field of the IGV passage was found to be affected by the presence of the rotor. The ratio of the tangential normal stresses to the radial normal stresses at the exit of the IGV was found to be more than doubled when compared to the case without the rotor. The rotor flow field measurements are presented in the relative mean velocity and turbulence stress contour at various cross section planes throughout the rotor. The cross flow and turbulence stress levels were found to be influenced by the presence of the incidence angle. Transportation of the high turbulence fluid by the cross flow was observed in the rotor blade passages. The panel code was run for both the IGV and the rotor geometries, and results were compared with the experimental time averaged velocity results at midspan. Dissert. Abstr.

N94-33443 Federal Aviation Administration, Atlantic City, NJ.
AIRCRAFT HIGH BYPASS FAN ENGINE PERFORMANCE
Robert Salmon Mar. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277722; DOT/FAA/CT-TN92/35) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The purpose of this technical note is to discuss the performance characteristics of high bypass fan engines. The performance of a CF6-6 type fan engine is compared to two types of modified engines based on the CF6-6 type design. The fully modified engine has an increased bypass ratio (5.8:1 to 9.0:1) and a variable fan pressure ratio. At takeoff power the modified engine produces the rated takeoff thrust of the standard CF6-6 engine with a 32 percent improvement in thrust specific fuel consumption (TSFC) and a turbine inlet temperature 460 deg F lower than the standard. At maximum continuous cruise power at 35,000 feet and Mn 0.8 the improvement in TSFC would be 18.8 percent and the turbine inlet temperature would be 270 deg F lower than the standard CF6-6 engine. The advantage in performance obtained by the increased bypass ratio and variable geometry fan more than offsets the increase in the engine weight that would result from these changes. DTIC

N94-33706*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MEASUREMENT OF THE COOLANT CHANNEL TEMPERATURES AND PRESSURES OF A COOLED RADIAL-INFLOW TURBINE
L. Danielle DiCicco, Brent C. Nowlin, and Lizet Tirres Jun. 1994 15 p Presented at the 18th AIAA Aerospace Ground Testing Conference, Colorado Springs, CO, 20-23 Jun. 1994; sponsored by AIAA
(RTOP 505-62-10)
(NASA-TM-106594; E-8866; NAS 1.15:106594; AIAA Paper 94-2561)
Avail: CASI HC A01/MF A01

Instrumentation has been installed on the surface of a cooled radial-inflow turbine. Thermocouples and miniature integrated sensor pressure transducers were installed to measure steady state coolant temperatures, blade wall temperatures, and coolant pressures. These measurements will eventually be used to determine the heat transfer characteristics of the rotor. This paper will describe the procedures used to install and calibrate the instrumentation and the testing methods followed. A limited amount of data will compare the measured values to the predicted values. Author

N94-33874# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Propulsion and Energetics Panel.
GUIDE TO THE MEASUREMENT OF THE TRANSIENT PERFORMANCE OF AIRCRAFT TURBINE ENGINES AND COMPONENTS [GUIDE POUR LA MESURE DES PERFORMANCES EN TRANSITOIRE DES TURBOMACHINES AERONAUTIQUES ET DE LEURS COMPOSANTS]
Earl H. Dudgeon, ed. (National Research Council of Canada, Ottawa, Ontario.) Mar. 1994 404 p
(AGARD-AR-320; ISBN-92-835-0739-8) Copyright Avail: CASI HC A18/MF A04

This report provides a guide for the measurement of transient aerothermodynamic performance parameters of aircraft gas turbine engines or components for engine developers, test agencies, certifying authorities, and operators of overhaul facilities and aircraft. It may be treated as an extension of AGARD Advisory Reports AR-245 and AR-248. It includes discussion of recommended procedures for the transient measurement of pressures, temperatures, flows, component geometry including rotational speed and clearances, thrust, torque, and the use of the engine control system for transient parameter measures. Typical examples are presented. A section on data acquisition and processing is included. Higher frequency dynamic measurements are excluded. Two examples, the measurement of compressor ratio and air flow at surge and a measurement of engine

acceleration time are discussed in detail. This Advisory Report was prepared at the request of the Propulsion and Energetics Panel of AGARD. Author

N94-33955*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THE EFFECTS OF VORTEX INGESTION ON THE FLOW IN A DIFFUSING S-DUCT

B. J. Wendt and B. A. Reichert Jun. 1994 12 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-29 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE

(RTOP 505-62-52)

(NASA-TM-106652; E-8964; NAS 1.15:106652; AIAA Paper 94-2811)

Copyright Avail: CASI HC A03/MF A01

An experimental study of the effects of an ingested vortex on the flowfield of a diffusing S-duct is reported. The vortex is generated through the use of a stationary pinwheel device mounted upstream of the diffusing S-duct. Three test conditions vary the location of the vortex in the duct inlet crossplane. For each condition of ingested vortex, a baseline S-duct and an S-duct with an array of vortex generators is examined. The data taken consist of duct inlet and exit crossplane surveys of velocity and total pressure. Duct surface flow visualization and static pressure are also recorded. The data acquired in these tests are compared to identical S-duct data taken in the absence of the ingested vortex. The ingested vortex is observed to have a strong influence on the flowfield inside (and exiting) the S-duct, but only when the vortex impinges at the inlet crossplane location coincident with the crossplane location of downstream flow separation within the duct. When the ingested vortex impinges at this location it reduces the extent of flowfield separation inside the baseline duct and promotes stronger crossflow in the exit plane of both the baseline duct and the duct with installed vortex generators. This enhanced crossflow also strengthens the vortices shed from the vortex generators. The other impingement locations of the ingested vortex are found to produce little effect on the flowfield of the duct with or without vortex generators.

Author

N94-33971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

DESIGN OF A LOW ASPECT RATIO TRANSONIC COMPRESSOR STAGE USING CFD TECHNIQUES

Nelson L. Sanger Jun. 1994 18 p Presented at the 39th International Gas Turbine and Aeroengine Congress and Exposition, The Hague, Netherlands, 13-16 Jun. 1994; sponsored by ASME

(RTOP 505-62-52)

(NASA-TM-106636; E-8938; NAS 1.15:106636) Avail: CASI HC A03/MF A01

A transonic compressor stage has been designed for the Naval Postgraduate School Turbopropulsion Laboratory. The design relied heavily on CFD techniques while minimizing conventional empirical design methods. The low aspect ratio (1.2) rotor has been designed for a specific head ratio of .25 and a tip relative inlet Mach number of 1.3. Overall stage pressure ratio is 1.56. The rotor was designed using an Euler code augmented by a distributed body force model to account for viscous effects. This provided a relatively quick-running design tool, and was used for both rotor and stator calculations. The initial stator sections were sized using a compressible, cascade panel code. In addition to being used as a case study for teaching purposes, the compressor stage will be used as a research stage. Detailed measurements, including non-intrusive LDV, will be compared with the design computations, and with the results of other CFD codes, as a means of assessing and improving the computational codes as design tools. Author

N94-33974*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

TIGGERC: TURBOMACHINERY INTERACTIVE GRID GENERATOR FOR 2-D GRID APPLICATIONS AND USERS GUIDE

David P. Miller May 1994 65 p Original contains color illustrations

(RTOP 505-62-10)

(NASA-TM-106586; E-8850; NAS 1.15:106586) Avail: CASI HC A04/MF A01; 3 functional color pages

A two-dimensional multi-block grid generator has been developed for a new design and analysis system for studying multiple blade-row turbomachinery problems. TIGGERC is a mouse driven, interactive grid generation program which can be used to modify boundary coordinates and grid packing and generates surface grids using a hyperbolic tangent or algebraic distribution of grid points on the block boundaries. The interior points of each block grid are distributed using a transfinite interpolation approach. TIGGERC can generate a blocked axisymmetric H-grid, C-grid, I-grid or O-grid for studying turbomachinery flow problems. TIGGERC was developed for operation on Silicon Graphics workstations. Detailed discussion of the grid generation methodology, menu options, operational features and sample grid geometries are presented. Author

N94-34146*# Pratt and Whitney Aircraft, East Hartford, CT.

COUPLED 2-DIMENSIONAL CASCADE THEORY FOR NOISE AND UNSTEADY AERODYNAMICS OF BLADE ROW INTERACTION IN TURBOFANS. VOLUME 1: THEORY DEVELOPMENT AND PARAMETRIC STUDIES Final Report

Donald B. Hanson Washington Jan. 1994 81 p

(Contract NAS3-25952; RTOP 535-03-10)

(NASA-CR-4506-Vol-1; E-7766-Vol-1; NAS 1.26:4506-Vol-1) Avail: CASI HC A05/MF A01

Typical analytical models for interaction between rotor and stator in a turbofan analyze the effect of wakes from the rotor impinging on the stator, producing unsteady loading, and thereby generating noise. Reflection/transmission characteristics of the rotor are sometimes added in a separate calculation. In those models, there is a one-to-one relationship between wake harmonics and noise harmonics; that is, the BPF (blade passing frequency) wake harmonic causes only the BPF noise harmonic, etc. This report presents a more complete model in which flow tangency boundary conditions are satisfied on two cascades in relative motion for several harmonics simultaneously. By an extension of S.N. Smith's code for two dimensional flat plate cascades, the noise generation/frequency scattering/blade row reflection problem is solved in a single matrix inversion. It is found that the BPF harmonic excitation of the stator scatters considerable energy in the higher BPF harmonics due to relative motion between the blade rows. Furthermore, when swirl between the rotor and stator is modeled, a 'mode trapping' effect occurs which explains observations on fans operating at rotational speeds below BFP cuton: the BPF mode amplifies between blade rows by multiple reflections but cannot escape to the inlet and exit ducts. However, energy scattered into higher harmonics does propagate and dominates the spectrum at two and three times BPF. This report presents the complete derivation of the theory, comparison with a previous (more limited) coupled rotor/stator interaction theory due to Kaji and Okazaki, exploration of the mode trapping phenomenon, and parametric studies showing the effects of vane/blade ratio and rotor/stator interaction. For generality, the analysis applies to stages where the rotor is either upstream or downstream of the stator and to counter rotation stages. The theory has been coded in a FORTRAN program called CUP2D, documented in Volume 2 of this report. It is concluded that the new features of this analysis - unsteady coupling, frequency scattering, and flow turning between rotor and stator - have a profound effect on noise generation caused by rotor/stator interaction. Treating rotors and stators as isolated cascades is not adequate for noise analysis and prediction. Author (revised)

N94-34216*# Colorado Univ., Boulder, CO. Dept. of Aerospace Engineering Sciences.

HIGH-PERFORMANCE PARALLEL ANALYSIS OF COUPLED PROBLEMS FOR AIRCRAFT PROPULSION Progress Report, Jul. 1993 - Jan. 1994

C. A. Felippa, C. Farhat, S. Lanteri, N. Maman, S. Piperno, and U. Gumaste May 1994 108 p

(Grant NAG3-1273)

(NASA-CR-195883; NAS 1.26:195883; CU-CAS-094-09) Avail: CASI HC A06/MF A02

This research program deals with the application of high-performance computing methods for the analysis of complete jet engines. We have entitled this program by applying the two dimensional parallel aeroelastic codes to the interior gas flow problem of a bypass jet engine. The fluid mesh generation, domain decomposition, and solution capabilities were successfully tested. We then focused attention on methodology for the partitioned analysis of the interaction of the gas flow with a flexible structure and with the fluid mesh motion that results from these structural displacements. This is treated by a new arbitrary Lagrangian-Eulerian (ALE)

technique that models the fluid mesh motion as that of a fictitious mass-spring network. New partitioned analysis procedures to treat this coupled three-component problem are developed. These procedures involved delayed corrections and subcycling. Preliminary results on the stability, accuracy, and MPP computational efficiency are reported.
Author (revised)

N94-34231*# Rotary Power International, Inc., Wood-Ridge, NJ.
STRATIFIED CHARGE ROTARY ENGINE CRITICAL TECHNOLOGY ENABLEMENT, VOLUME 1 Final Report, Feb. 1990 - 1992
C. E. Irion and R. E. Mount Aug. 1992 279 p
(Contract NAS3-25945; RTOP 505-62-10)
(NASA-CR-189106-Vol-1; E-8831-Vol-1; NAS 1.26:189106-Vol-1) Avail: CASI HC A13/MF A03

This report summarizes results of a critical technology enablement effort with the stratified charge rotary engine (SCRE) focusing on a power section of 0.67 liters (40 cu. in.) per rotor in single and two rotor versions. The work is a continuation of prior NASA Contracts NAS3-23056 and NAS3-24628. Technical objectives are multi-fuel capability, including civil and military jet fuel and DF-2, fuel efficiency of 0.355 Lbs/BHP-Hr. at best cruise condition above 50 percent power, altitude capability of up to 10Km (33,000 ft.) cruise, 2000 hour TBO and reduced coolant heat rejection. Critical technologies for SCRE's that have the potential for competitive performance and cost in a representative light-aircraft environment were examined. Objectives were: the development and utilization of advanced analytical tools, i.e. higher speed and enhanced three dimensional combustion modeling; identification of critical technologies; development of improved instrumentation, and to isolate and quantitatively identify the contribution to performance and efficiency of critical components or subsystems. Author

N94-34233*# Rotary Power International, Inc., Wood-Ridge, NJ.
STRATIFIED CHARGE ROTARY ENGINE CRITICAL TECHNOLOGY ENABLEMENT. VOLUME 2: APPENDIXES Final Report
C. E. Irion and R. E. Mount Aug. 1992 198 p
(Contract NAS3-25945; RTOP 505-62-10)
(NASA-CR-189106-Vol-2; E-8831-Vol-2; NAS 1.26:189106-Vol-2) Avail: CASI HC A09/MF A03

This second volume of appendixes is a companion to Volume 1 of this report which summarizes results of a critical technology enablement effort with the stratified charge rotary engine (SCRE) focusing on a power section of 0.67 liters (40 cu. in.) per rotor in single and two rotor versions. The work is a continuation of prior NASA Contracts NAS3-23056 and NAS3-24628. Technical objectives are multi-fuel capability, including civil and military jet fuel and DF-2, fuel efficiency of 0.355 Lbs/BHP-Hr. at best cruise condition above 50 percent power, altitude capability of up to 10Km (33,000 ft.) cruise, 2000 hour TBO and reduced coolant heat rejection. Critical technologies for SCRE's that have the potential for competitive performance and cost in a representative light-aircraft environment were examined. Objectives were: the development and utilization of advanced analytical tools, i.e. higher speed and enhanced three dimensional combustion modeling; identification of critical technologies; development of improved instrumentation; and to isolate and quantitatively identify the contribution to performance and efficiency of critical components or subsystems. A family of four-stage third-order explicit Runge-Kutta schemes is derived that required only two locations and has desirable stability characteristics. Error control is achieved by embedding a second-order scheme within the four-stage procedure. Certain schemes are identified that are as efficient and accurate as conventional embedded schemes of comparable order and require fewer storage locations. Author

N94-34400 Research Triangle Inst., Research Triangle Park, NC.
TOXIC EMISSIONS FROM AIRCRAFT ENGINES: A SEARCH OF AVAILABLE LITERATURE
Jul. 1993 91 p See also PB94-152303 Sponsored by EPA Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-156486; EPA/453/R-93/028) Avail: Issuing Activity (National Technical Information Service (NTIS))

The purpose of the work is to find what recent data are available to characterize toxic air emissions from aircraft engines as to specific compounds and their health effects. Specific items of interest are emissions from helicopter, civil, and military engines differentiated by mode of operation such as takeoffs, landings, taxiing, and idle. NTIS

N94-34431# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Propulsion and Energetics Panel.
TECHNOLOGY REQUIREMENTS FOR SMALL GAS TURBINES [LES TECHNOLOGIES POUR LES PETITES TURBINES A GAS]
Mar. 1994 474 p In ENGLISH and FRENCH The 82nd Symposium was held in Montreal, Quebec, 4-8 Oct. 1993 Original contains color illustrations
(AGARD-CP-537; ISBN-92-835-0738-X) Copyright Avail: CASI HC A20/MF A04

These Conference Proceedings contain the papers presented at the Propulsion and Energetics Panel 182nd Symposium on Technology Requirements for Small Turbines which was held from 4th-8th October 1993, in Montreal, Canada. The Technical Evaluation Report and the Technology Overview Address are included at the beginning, and discussions follow most papers. The Symposium was arranged in the following Sessions: Technology Overview; Turboshaft Engines; Turbofan Engines; Auxiliary Power Units; Compressors 1 - Centrifugal; Compressors 2 - Axial; Combustors; Turbines 1 - Axial; Turbines 2 - Radial; Structures and Materials; and Bearings. For individual titles, see N94-34432 through N94-34466.

N94-34432# Ministry of Defence, London (England). Directorate of Future Air Systems.
OPERATIONAL REQUIREMENTS FOR HELICOPTER ENGINES FOR UK SERVICES
M. D. Paramour and P. G. Jennings *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p (For primary document see N94-34431 10-07)
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This paper reviews the requirements of the United Kingdom Armed Services for helicopter engines and the technology developments that will be necessary to meet these requirements. The work that is being done in the UK to ensure that this technology is demonstrated in a timely manner is also examined. Reductions in defense budgets will have a considerable effect on the requirements, and the paper also addresses the effect such reductions will have on future technology. Whilst there continues to be a divergence between naval and land-based requirements, overriding importance is now being given by all operators to cost of ownership issues. The need to reduce the cost of ownership will therefore need to influence all the research and technology demonstration programs on which future engines will rely. Author

N94-34433# Rolls-Royce Ltd., Bristol (England).
HELICOPTER ENGINE/AIRFRAME INTEGRATION: THE WAY AHEAD **c05**
D. L. Mann and D. V. Humpherson *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 12 p Sponsored in part by Ministry of Defence (For primary document see N94-34431 10-07)
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The importance of successful integration of a turboshaft engine into the recipient helicopter becomes ever more apparent as the market demands a product which is able to carry more payload, over greater distances, in a reduced time, with greater reliability, and at lower cost. New technology developments in individual vehicle systems alone will not be sufficient to ensure future competitiveness. Engine/airframe integration has a significant, previously neglected, role to play. Important direct performance improvements may potentially be exceeded by synergistic, spin-off benefits to other components. In some areas, such as stealth, adequate consideration of integration matters is becoming mandatory. The paper reviews some helicopter component technology directions and observes the implications of harnessing these technologies into integrated systems. Particular attention is paid to integrated intake and exhaust system designs as well as a more general look at overall vehicle integration. A final section discusses integration technology requirements and how they may be employed to produce a fully integrated airframe and engine design philosophy. Author

N94-34434# Technische Univ., Munich (Germany).
MTR390, THE NEW GENERATION TURBOSHAFT ENGINE
August Spirkl *In* AGARD, Technology Requirements for Small Gas

Turbines Mar. 1994 8 p (For primary document see N94-34431 10-07)
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In June 1993, the MTR390 has completed all its important certification tests. This marks a major step in the development and qualification program of this engine which was selected to power the new German/French anti-tank, support and attack helicopter, the EUROCOPTER TIGER and GERFAUT. The MTR390 is a new turboshaft engine in the 1000KW (1300shp) range being jointly developed by three of the largest European aero engine companies: MTU in Germany, TURBOMECA in France, and ROLLS-ROYCE in Great Britain. The joint company MTR GmbH which is registered in Germany, acts as contractor for the German and French governments. MTR directs and coordinates the development, production, marketing, sales, and customer support of the MTR390 engine for the Franco-German helicopters and other potential applications. The three companies have been working together for more than 25 years on several programs like Adour, Larzac, RB199, EJ200, RTM322,.... The declared goal of the MTR partner companies is to create an engine that will not only suit the TIGER/GERFAUT program but will also compete in the military and civil market for the next 20 to 30 years. Author

N94-34435# Alfa Romeo S.p.A., Naples (Italy). Research and Development.
AEROTHERMAL DESIGN OF 1600 K TET CORE ENGINE HOT-SECTION COMPONENTS FOR HIGH-TECHNOLOGY COMPACT PROPULSION SYSTEMS
S. Colantuoni, A. Colelle, G. Santoriello, L. Cirillo, and C. Iossa *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 24 p (For primary document see N94-34431 10-07)
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The paper describes the aerodynamic and thermal design for the hot-section core engine components, i.e. the combustor and the HP turbine, for an application related to a propulsion system of 1000 kW class. The annular reverse-flow flame-tube is very compact in length and radial dimensions. The high pressure gas-generator turbine is an axial-flow single stage, aerodynamically high loaded, and has nozzle vanes as well as rotor blades cooled by impingement, film cooling and forced enhanced convection techniques. Furthermore the core engine hot section rig has been designed to allow, through an extensive experimental program, the verification of the performances, and to study the impact of the cooling systems on the thermo-mechanical behavior of the components. Author

N94-34436# Pisa Univ. (Italy). Dipt. di Energetica.
NON-FOLLUTING GAS TURBINE AS A RESULT OF SELF-HEATING WORKING FLUID IN A CLOSED CIRCUIT
Dino Dini *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 5 p (For primary document see N94-34431 10-07)
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Design and experimental results of a small turboshaft operating with self-heating working fluid are presented here. The working fluid is water steam produced through H2, O2, H2O combustion, water being injected gradually on the H2/O2 stoichiometric combustion products. High pressure (50 divided by 70 bar) and high temperature (1000 divided by 1500 K) water steam is involved, respectively, because of mechanically driven pumps for liquid hydrogen and oxygen and water, and because their combustion. So, water steam is operating the turboshaft until vacuum pressure condenses in an aircondenser after a previous heat exchange, in a closed cycle. Only a part of the steam latent heat is going to the environment. An overall thermodynamic design, and a more detailed combustor design, are presented, showing high cycle efficiency and validity for such a non-polluting turboshaft. Experimental results of the H2/O2/H2O combustor are reported. Applications are suggested for small power entertainment airplanes, rescue helicopters, and non-polluting airport ground vehicles. Author

N94-34437*# Army Aviation Research and Development Command, Cleveland, OH. Vehicle Propulsion Directorate.
ANALYSIS OF RIG TEST DATA FOR AN AXIAL/CENTRIFUGAL COMPRESSOR IN THE 12 KG/SEC
A. K. Owen *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 30 p Sponsored by NASA. Lewis Research Center (For primary document see N94-34431 10-07)
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Extensive testing was done on a T55-L-712 turboshaft engine compressor in a compressor test rig at TEXTRON/Lycoming. These rig tests will be followed by a series of engine tests to occur at the NASA Lewis Research Center beginning in the last quarter of 1993. The goals of the rig testing were: (1) map the steady state compressor operation from 20 percent to 100 percent design speed, (2) quantify the effects of compressor bleed on the operation of the compressor, and (3) explore and measure the operation of the compressor in the flow ranges 'beyond' the normal compressor stall line. Instrumentation consisted of 497 steady state pressure sensors, 153 temperature sensors and 34 high response transducers for transient analysis in the pre- and post-stall operating regime. These measurements allow for generation of detailed stage characteristics as well as overall mapping. Transient data is being analyzed for the existence of modal disturbances at the front face of the compression system ('stall precursors'). This paper presents some preliminary results of the ongoing analysis and a description of the current and future program plans. It will primarily address the unsteady events at the front face of the compression system that occur as the system transitions from steady state to unsteady (stall/surge) operation. Author

N94-34438# Williams International, Walled Lake, MI.
EXPENDABLE GAS TURBINE ENGINE TECHNOLOGY ADVANCES
G. S. Cruzen *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p (For primary document see N94-34431 10-07)
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New materials and component technologies are undergoing feasibility assessment in expendable gas turbine demonstrator engines. The new technologies, developed under the Integrated High Performance Turbine Engine Technologies (IHPTET) and other initiatives, address the need for improved engine performance, lower cost, and lighter weight. Engine and rig tests conducted on high temperature composite turbine components, fuel-lubricated ceramic bearings, low cost, light weight organic composite structures, and a novel low cost cooled turbine rotor concept are described in this paper. Also, additional development requirements for transitioning these technologies to production applications are defined. Author

N94-34439# BMW Rolls-Royce AeroEngines G.m.b.H., Lohhof (Germany).
EXPERIMENTAL INVESTIGATION AND PERFORMANCE ANALYSIS OF THE TURBOJET ENGINE T117
Gernot Eisenlohr and Peter Hoechst *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 7 p (For primary document see N94-34431 10-07)
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The T117 Turbojet Engine (formerly KHD T117) is a single shaft light weight turbojet of the 1000 N thrust class. It was especially developed to fit into the reconnaissance drone Canadair CL 289. The demand for smallest possible size of the compressor to fit the constraints of outer diameter and axial length of the complete engine showed early that only a single stage radial compressor would be applicable. The compression system of this turbojet is described in some detail. The performance maps of the compressor at the test-stand without and with turbojet inlet system are shown. Calculated and measured operating lines in the performance maps show good agreement. Tests with several production engines to establish the compressor performance map are shown and they confirm the compressor map with turbojet inlet system at the compressor test-stand. Enough surge margin for the jet-engine is demonstrated. Investigations with curve flight simulation show a stable performance of the jet engine. Author

N94-34440# Microturbo, Toulouse (France). Chemin du Pont de Rupe.
MICROTURBO'S EXPERIENCE IN THE FIELD OF APU FOR CIVIL AND MILITARY APPLICATIONS AND OUR ROLE IN THE FACE OF THE CHALLENGES OF THE FUTURE [EXPERIENCE DE LA SOCIETE MICROTURBO DANS LE DOMAINE DES GROUPES AUXILIAIRES DE PUISSANCE POUR LES BESOINS MILITAIRES ET CIVILS: NOUVELLES EXIGENCES POUR L'AVENIR]
Norbert Hirtz and Charles Mischel *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 14 p In FRENCH (For primary document see N94-34431 10-07)
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For more than thirty years, Microturbo has designed, developed, and manufactured gas turbines to supply mechanical and pneumatic power for a multitude of applications: airborne and land based; and civil and military. Over the years, continuous technological improvements in engine aerodynamics, thermodynamics, combustion, mechanics, acoustics, and a parallel modernization of fuel management and other engine systems, has enabled Microturbo to develop a range of products which are specifically geared to today's demands and perfectly adapted to those of the future. A summary of the efforts of Microturbo is presented. Author (revised)

N94-34441# Turbomeca S.A. - Brevets Szydlowski, Bordes (France).
SPECIFICATIONS OF AUXILIARY POWER UNITS FOR CONFORMITY WITH HELICOPTER TURBOSHAFT ENGINES [SPECIFICITE DES GROUPES AUXILIAIRES DE PUISSANCE PAR RAPPORT AUX TURBOMOTEURS D'HELICOPTERE]
Joel Silet *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 14 p In FRENCH (For primary document see N94-34431 10-07)
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Despite an apparent similarity with helicopter turboshaft engines--in terms of power level, construction, and type of components--Auxiliary Power Units (APU) have special needs that differ from those of helicopter gas turbine engines. The differences can be found in the following areas: integration of aircraft pneumatic and electric systems; combustion chambers; low acoustic levels; low oil consumption; and efficiency requirements.
Author (revised)

N94-34442# Fiat Aviazione S.p.A., Turin (Italy). Direzione Progettazione.
THE DEVELOPMENT OF AN AUXILIARY POWER UNIT FOR A FIGHTER AIRCRAFT
C. Vinci, E. Campo, and A. Trovati *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 18 p (For primary document see N94-34431 10-07)
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The design of an APU is a comprise between several, often conflicting, requirements: installation constraints, performance, duty cycle, weight, reliability, and Life Cycle Cost. This document presents a summary of the significant technology developments that were accomplished on a FiatAvio Auxiliary Power Unit. The APU is a two-spool modular gas turbine that has a pneumatic power rating of 150 HP. A particular effort was dedicated to the development of the full authority digital control system. The APU was certified in 1987, and the first production unit entered service a year and a half later. Author (revised)

N94-34443# Textron Lycoming, Stratford, CT.
ADVANCED CONCEPTS FOR NEXT GENERATION SMALL GAS TURBINE ENGINE COMPRESSORS
Arun K. Sehra and Howard F. Merrick *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 7 p (For primary document see N94-34431 10-07)
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The trend in advanced gas turbine engines is towards lightweight, high performance, compact, reliable compression systems. This has created a need for a compression system capable of delivering extremely high stage pressure ratios. Textron Lycoming is currently developing multistage axial compressors with average pressure ratios in excess of 2.5 and single axial stages capable of delivering pressure ratios in excess of 3.5. Major advances in the aerodynamic design techniques and material/structural technologies are necessary to achieve the performance and weight objectives of these compression systems. This paper describes some of the recent advances made in the aero design concepts (swept shock rotors, splittered rotors), computational fluid mechanics, active stabilization system, and material/structural innovations (metal matrix composite titanium aluminide impellers) to meet the challenge of the next generation of gas turbine compression systems. Author (revised)

N94-34444# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec).
ADVANCED SMALL HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSOR
M. H. Kalogiannis, A. D. LeBlanc, and S. M. Przybytkowski *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 6 p (For primary document see N94-34431 10-07)
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This paper describes the design approach for a high pressure ratio, single-stage, centrifugal compressor that meets current small helicopter engine performance requirements. Test results are provided for a 10:1 pressure ratio single-stage having 80 percent efficiency and 27 percent surge margin. Development of three dimensional computational fluid dynamics has generated the tools to design impellers with improved surge margin while maintaining state of the art efficiency. Further development of Euler and Navier-Stokes codes is required to analytically optimize the impeller-diffuser match and to improve efficiency levels. Author (revised)

N94-34445# Turbomeca S.A. - Brevets Szydlowski, Bordes (France).
THE CENTRIFUGAL COMPRESSOR, AN ESSENTIAL COMPONENT OF SMALL AND MEDIUM POWER ENGINES [LE COMPRESSEUR CENTRIFUGE, COMPOSANT ESSENTIEL DES TURBOMOTEURS DE PETITE ET MOYENNE PUISSANCE]
P. Belaygue and H. Vignau *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 15 p In FRENCH Original contains color illustrations (For primary document see N94-34431 10-07)
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Originally, the centrifugal compressor formed the basis of the first aeronautical applications of turboshaft engines. Recently, it has been almost exclusively used behind axial compressors as the last compression stage in turbines of small and medium power, with a moderate pressure ratio. As a result of numerous studies which have been carried out during the last two decades, it has been elevated to a key position. Thanks to the progress in the field of analytical tools (concerning aerodynamics, structures, and heat transfer), materials, and processes, its characteristics are such that, besides its traditional use as the last compression stage, it can also perform the following functions: (1) form the only compression stage (up to a compression ratio of 12); and (2) be combined with another centrifugal stage to reach an overall pressure ratio of 20 without using variable geometry. Because of the great simplicity ot the assembly, its intrinsic performance (efficiency, pressure ratio, surge margin, low sensitivity to clearances, and distortions) as well as its ease of integration, it is considered as an essential component to be used in an helicopter engine, the requirements of which can be classified as follows: high specific power, very good reliability, low cost, and performance compromise--cruise specific consumption, emergency power, and response time in transient condition. Its present capacity to run with higher specific flows and the use of variable geometry open new doors to other applications: jet engines and auxiliary power units.
Author (revised)

N94-34446*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
EXPERIMENTAL AND COMPUTATIONAL RESULTS FROM A LARGE LOW-SPEED CENTRIFUGAL IMPELLER
M. D. Hathaway (Army Aviation Research and Development Command, Cleveland, OH.), R. M. Chriss, J. R. Wood, and A. J. Strazisar *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 11 p See also N94-20136 (For primary document see N94-34431 10-07)
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An experimental and computational investigation of the NASA Low-Speed Centrifugal Compressor (LSCC) flow field was conducted using laser anemometry and Dawes' 3D viscous code. The experimental configuration consists of a back-swept impeller followed by a vaneless diffuser. Measurements of the three-dimensional velocity field were acquired at several measurement planes through the compressor. The measurements describe both the throughflow and secondary velocity field along each measurement plane and, in several cases, provide details of the flow within the blade boundary layers. The experimental and computational results provide a clear understanding of the development of the throughflow momentum wake which is characteristic of centrifugal compressors.
Author (revised)

N94-34447# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Inst. fuer Antriebstechnik.
FLOW FIELD ANALYSIS IN A HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSOR c34

H. Pak, H. Krain, and B. Hoffmann *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 12 p (For primary document see N94-34431 10-07)

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Detailed experimental and theoretical flow field studies were carried out for a high pressure ratio impeller with a high flow coefficient associated with transonic inlet flow. Experimental data were obtained by using the Laser-Two-Focus velocimetry. A 3D viscous code was applied to calculate the flow field. Comparisons between measured and calculated data are presented for 10 cross flow planes with special attention given to the impeller inlet, which is where the transonic flow occurs. Author (revised)

N94-34448# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Turbomachinery Dept.

INVERSE DESIGN OF RADIAL FLOW IMPELLERS WITH PRESCRIBED VELOCITY AT HUB AND SHROUD **c34**

R. A. VandenBraembussche, A. Demeulenaere, and J. Borges *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p (For primary document see N94-34431 10-07)

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The method described in this paper allows the detailed design of a complete radial impeller geometry starting from a prescribed suction and pressure side velocity distribution at the hub and shroud. The average velocity at the hub and shroud is used to define the meridional contours. The corresponding blade loading is used to define the blade shape at the hub and shroud. Impellers designed with this method were analyzed by a quasi 3D finite element analysis method. Results show good agreement between the imposed and the calculated Mach number distribution. The method was complemented with an inverse Euler solver capable of designing shock free transonic blades on the previously defined axisymmetric streamsurface. Compared to other inverse methods, this one has the advantage of starting from the velocity distribution itself and requires only a small amount of computer time. Author (revised)

N94-34449# Sundstrand Power Systems, San Diego, CA.

COMPACT DIFFUSERS FOR SMALL TRANSONIC COMPRESSORS

Colin Rodgers *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 22 p (For primary document see N94-34431 10-07)

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Smaller, smarter, airbreathing propelled tactical missiles are being proposed and developed. They will function for various military duties currently performed by larger, limited range missiles or manned surveillance and interdiction aircraft. The extreme compactness of these missiles requires relatively high power density small turbojets. The missile air inlet location and configuration in many of these applications may impose highly distorted compressor inlet flow conditions, with potentially deleterious effects upon compressor performance, both in terms of flow range stability and compression efficiency. Renewed interest has therefore been focused upon alternative compressor design solutions with improved stability, more tolerant to flow distortion effects. In this respect, splitting the compression diffusion process into multirow or tandem cascades has been proposed as a means of attaining increased flow range and efficiency, both in axial and centrifugal compressors. Centrifugal compressors are popular for small, low cost, expendable missiles, especially with compact diffusers permitting reduced frontal area. An experimental study of the effect of a tandem radial cascade diffuser configuration on the performance of a small, high specific speed transonic centrifugal compressor stage is described in this paper. Tests showed the importance of the first tandem row on overall compressor performance and demonstrated higher flow range at the expense of slightly reduced efficiency, as compared to an optimum channel type diffuser. Author

N94-34450# BMW Rolls-Royce AeroEngines G.m.b.H., Lohhof (Germany).

AERODYNAMIC DESIGN AND INVESTIGATION OF A MIXED FLOW COMPRESSOR STAGE **c34**

Gernot Eisenlohr and Friedrich Wilhelm Benfer *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p Sponsored by BMFT (For primary document see N94-34431 10-07)

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Topic of this contribution is a single stage mixed flow compressor with 6:1 pressure ratio, which is under development as a component for a turbojet. Primary design aim for the stage was to achieve minimum frontal area at a high efficiency level. Excerpts of the considerations and calculations for determining the design rotational speed and the main dimensions of this mixed flow compressor stage are presented first. Some explanations concerning the definition of the meridional contours and the generation of the blading are given, supplemented by several results of the impeller flow calculations. After a brief description of the test rig and its instrumentation, the measured impeller characteristics are presented. They show that the impeller meets its design pressure ratio and exceeds the efficiency target. For selected operating points the measured pressure distributions along the impeller outer contour are compared with the predicted static pressure rise. The discussions of the test results closes with the measured mixed flow compressor map which reveals that the overall stage performance does not fully meet the design goals, mainly because of high losses in the diffusing system. Author (revised)

N94-34451# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Inst. fuer Antriebstechnik.

DESIGN AND ANALYSIS OF A HIGHLY LOADED TRANSONIC COMPRESSOR CASCADE **c34**

E. Nicke, W. Steinert, A. Weber, and H. Starken *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 14 p (For primary document see N94-34431 10-07)

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Starting from two existing cascades a new one was developed for the same inlet and exit flow conditions but increased pitch to chord ratio: inlet Mach number M(sub 1) = 1.09, flow turning Theta = 14 degrees, and pitch to chord ratio s/c = 0.8. Perspective research goal is the determination of the loading limits of transonic compressor cascades. The design was performed in the direct mode using a two dimensional Euler code coupled iteratively with an integral boundary layer code generating a profile Mach number distribution that avoids boundary layer separation. The experiments in a transonic cascade wind tunnel revealed performance, profile, Mach number distribution, and wake traverse data. A laser, two focus measurement technique was used to analyze the flow field upstream of the cascade and around the leading edge. The experimental results are analyzed by the Euler code. To improve the reliability of experimental as well as numerical inlet flow angle determination, the influence of conventional inlet boundary conditions versus so called nonreflecting boundary conditions was tested and verified using the L2F results. Author (revised)

N94-34452*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

COMBUSTOR TECHNOLOGY FOR FUTURE SMALL GAS TURBINE AIRCRAFT

Valerie J. Lyons and Richard W. Niedzwiecki *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 17 p See also N94-13142 (For primary document see N94-34431 10-07)

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To enhance fuel efficiency, future advanced small gas turbine engines will utilize engine cycles calling for overall engine pressure ratios, leading to higher combustor inlet pressures and temperatures. Further, the temperature rise through the combustor and the corresponding exit temperature are also expected to increase. This report describes future combustor technology needs for small gas turbine engines. New fuel injectors with large turndown ratios which produce uniform circumferential and radial temperature patterns will be required. Uniform burning will be of greater importance because hot gas temperatures will approach turbine material limits. The higher combustion temperatures and increased radiation at high pressures will put a greater heat load on the combustor liners. At the same time, less cooling air will be available as more of the air will be used for combustion. Thus, improved cooling concepts and/or materials requiring little or no direct cooling will be required. Although presently there are no requirements for emissions levels from small gas turbine engines, regulation is anticipated in the near future. This will require the development of low emission combustors. In particular, nitrogen oxides will increase substantially if new technologies limiting their formation are not evolved and implemented. For example, staged combustion employing lean, premixed/prevaporized, lean direct injection, or rich burn-quick quench-lean burn concepts could replace conventional single stage combustors. Due to

combustor size considerations, staged combustion is more easily accommodated in large engines. The inclusion of staged combustion in small engines will pose greater combustor design challenges. Author

N94-34453# General Electric Co., Lynn, MA. Aircraft Engines Div.
COMBUSTOR TECHNOLOGY FOR SMALL AIRCRAFT ENGINES
Stephen Howell *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p (For primary document see N94-34431 10-07)
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A review of aircraft gas turbine engine performance trends indicates that the smaller the engine the lower are its cycle pressure ratios, which suggests the less the combustor design challenge. This is often reflected in projected development effort. In fact, many aspects of combustor design and performance are adversely affected in smaller engines. Furthermore, when emission reduction requirements are extended to smaller engines, the design comprises needed to meet all performance goals will become particularly acute, and design solutions from large combustors may not be applicable. Author

N94-34454# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec).
LOW EMISSION COMBUSTOR TECHNOLOGY FOR SMALL AIRCRAFT GAS TURBINES
H. C. Eatock and P. Sampath *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 15 p Sponsored by Dept. of National Defence and Dept. of Industry, Trade and Commerce Original contains color illustrations (For primary document see N94-34431 10-07)
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This paper addresses small aircraft gas turbine emissions from the viewpoints of environmental impact and control technologies. Improvements achieved in small engine emissions without regulatory control are highlighted, as well as limitations on applicability of 'large-engine' technologies due to scale constraints and the highly cost-sensitive small engine market. Author

N94-34455# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec).
REDUCING TEMPERATURE DISTRIBUTION FACTOR (TDF) FOR ADVANCED SMALL GAS TURBINE ENGINES
L. A. Prociw, T. C. J. Hu, and R. R. Hastings *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 27 p Original contains color illustrations (For primary document see N94-34431 10-07)
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This paper discusses CFD applications to the analysis and optimization of the temperature distribution factor (TDF) in small, high intensity complex flow field gas turbine combustors. TDF is a term used to describe the nonuniformity of the temperature profile in the combustor exit plane which results from the inability to fully mix out temperature peaks. Hot end durability will be locally affected by temperature peaks whereas total energy exchange is dependent on the gas path bulk average temperature rise. Control of the TDF thus allows increased overall efficiency from both the cycle temperature and cooling load perspective while minimizing hot end distress. Computational fluid dynamic analysis of three dimensional combustor flows and the empirical validation of results are used to demonstrate the effectiveness of CFD as a design tool in this challenging environment. Author

N94-34456# Motoren- und Turbinen-Union Muenchen G.m.b.H. (Germany).
DEVELOPMENT OF A HP-TURBINE FOR A SMALL HELICOPTER ENGINE
H.-J. Dietrichs, F. Malzacher, and K. Broichhausen *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

High specific power and a small SFC are major objectives in the development of advanced turbo shaft engines. The reduced number of turbine stages leads to a considerable increase of their aerodynamic loading. The design and development of a transonic single stage turbine for a pressure ratio Pi equals 3.6 was carried out at MTU in a technology and demonstration program. Results of the extensive annular cascade, cold flow rig, and gas generator engine testing are presented including detailed investigations of transonic vane and blade flow fields, stator/rotor matching effects, and the influence of film cooling flow and tip clearance variations on the turbine performance. Author (revised)

N94-34457# Technische Univ., Dresden (German D.R.). Inst. fuer Energietechnik.
THE INFLUENCE OF THE INLET BOUNDARY LAYERS ON THE SECONDARY LOSSES OF TURBINE STAGES
H. Sauer and H. Wolf *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 6 p Sponsored by Ministry of Science and Technology (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

The efficiency level of turbine stages with small blade height is mainly determined by the endwall losses because they are significantly higher than the profile losses. In spite of extensive research work in this field, there are still some unsatisfactorily solved problems. The paper deals with two problems: the increase of the endwall losses downstream the cascade and the influence of the cascade inlet boundary layer thickness on the endwall losses. Because the inlet boundary layer is twisted mainly by the tip clearance vortex of the cascade upstream, the effect of a skewed inlet boundary layer is shown as well. Finally, measurement results of a turbine stage with blade height L equals 30 mm (D(sub m)/L equals 13) are shown for the cases with and without shroud. Author (revised)

N94-34458# National Research Council of Canada, Ottawa (Ontario). Turbomachinery Aerodynamics Group.
EFFECT OF TIP CLEARANCE ON THE PERFORMANCE OF A HIGHLY LOADED TURBINE STAGE
U. W. Schaub, E. Vlasic, and S. H. Moustapha *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 11 p Prepared in cooperation with Pratt and Whitney Aircraft of Canada Ltd., Longueuil, Quebec (For primary document see N94-34431 10-07)
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This paper describes the performance of a highly loaded turbine stage with a pressure ratio of 3.75 and a stage loading of 2.47. Tests were carried out with two rotor blade counts at design and 70 percent speeds for a range of tip clearances from 1.1 to 2.1 percent of blade span. The results are presented in the form of radial distribution of stage exit swirl and efficiency and are compared with the prediction of a 3-D Euler flow solver. The measured efficiency drop for a 1 percent change in tip clearance is 2.6 and 1.1 percentage points at 100 and 70 percent speed, respectively. The efficiency drop reduced from 2.6 to 1.7 percentage points with a 33 percent reduction in blade count. The effect of clearance variation on stage exit conditions was seen to extend over most of the blade span. Author

N94-34459*# Allied-Signal Aerospace Co., Phoenix, AZ. Turbine Aerodynamics.
DESIGN AND AERODYNAMIC PERFORMANCE EVALUATION OF A HIGH-WORK MIXED FLOW TURBINE STAGE
Remo N. Neri, Thomas J. Elliott, David N. Marsh, and Kestutis C. Civinskas *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 16 p Sponsored by NASA. Lewis Research Center and Army Research Lab. (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

As axial and radial turbine designs have been pushed to their aerothermodynamic and mechanical limits, the mixed-flow turbine (MFT) concept has been projected to offer performance and durability improvements, especially when ceramic materials are considered. The objective of this NASA/U.S. Army sponsored mixed-flow turbine (AMFT) program was to determine the level of performance attainable with MFT technology within the mechanical constraints of 1997 projected ceramic material properties. The MFT geometry is similar to a radial turbine, exhibiting a large radius change from inlet to exit, but differing in that the inlet flowpath is not purely radial, nor axial, but mixed; it is the inlet geometry that gives rise to the name 'mixed-flow'. The 'mixed' orientation of the turbine inlet offers several advantages over radial designs by allowing a nonzero inlet blade angle yet maintaining radial-element blades. The oblique inlet not only improves the particle-impact survivability of the design, but improves the aerodynamic performance by reducing the incidence at the

blade inlet. The difficulty, however, of using mixed-flow geometry lies in the scarcity of detailed data and documented design experience. This paper reports the design of a MFT stage designed with the intent to maximize aerodynamic performance by optimizing design parameters such as stage reaction, rotor incidence, flowpath shape, blade shape, vane geometry, and airfoil counts using 2-D, 3-D inviscid, and 3-D viscous computational fluid dynamics code. The aerodynamic optimization was accomplished while maintaining mechanical integrity with respect to vibration and stress levels in the rotor. A full-scale cold-flow rig test was performed with metallic hardware fabricated to the specifications of the hot ceramic geometry to evaluate the stage performance. Author

N94-34460# Cranfield Inst. of Tech., Bedford (England). Dept. of Turbomachinery and Engineering Mechanics.
NOZZLE GUIDE VANE FLOW IN RADIAL INFLOW TURBINES
Sohail H. Zaidi and Robin L. Elder *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 13 p Sponsored by European Research Office (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

Radial inflow turbines have various applications in industry and are being used as major components of gas turbines and turbochargers. The details of the flow phenomena within these machines are ill-define especially in small high speed units where small passages and high velocities are involved. To gain a better understanding of these flow processes, a small radial inflow turbine has been studied using laser anemometry. The main area of interest has been the region between the nozzle guide vanes and the turbine rotor. The flow in this region has been investigated at several positions across the nozzle guide vane pitch and span. The influence of the passing blades on the guide vane flow has also been studied. The results obtained have been compared with those from a previously studied (comparative) unit. The flow phenomena from the two machines differ quite markedly in the extent of the distortion observed at the nozzle guide vane and rotor interface. Author

N94-34461# Ulstein Turbine A/S, Kongsberg (Norway).
TURBINE BLADE DYNAMICS AND BLADE-VANE INTERACTION IN A RADIAL INFLOW TURBINE
A. Wilson and T. Utengen *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 11 p (For primary document see N94-34431 10-07)
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This paper is divided into two parts. In the first part it describes the aerodynamic design of radial flow nozzle guide vanes (NGV's) and the excitation forces from the NGV flow on the rotor. The second part, which is the section on structural analysis, describes the design efforts made for avoiding serious vibration problems in a radial inflow turbine. Author

N94-34462# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec).
NUMERICAL SIMULATION OF AIRFOIL FILM COOLING: A JET IN CROSSFLOW **c34**
H. J. Saabas and A. Riahi *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 13 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

A control volume finite difference method based on the work of Rhie in conjunction with a two layer turbulence model has been used to predict mean velocities, turbulent kinetic energy, and film effectiveness profiles downstream of a single round jet normal to cross stream at a mass flux ratio of unity. Computations were obtained for domain discretizations in which (1) the jet velocity, and turbulent kinetic energy profiles were specified at the inlet to the cross flow, and (2) the jet delivery tube and the cross flow were solved for simultaneously using a multiblock approach. The multiblock solutions were carried out for both a circular and rectangular representation of the jet. The numerical results are compared to experimental measurements available in the open literature. The comparisons indicate that the modeling of the hole as circular or rectangular had only a small influence on the predicted flow field and film effectiveness downstream of the hole. However, when jet inlet profiles are specified (rather than calculated), the resulting flow field predictions show deviations from the multiblock solutions especially in the near hole region. This leads to poor agreement between predicted and observed film effectiveness distributions. Author

N94-34463# Turbomeca S.A. - Brevets Szydlowski, Bordes (France).
VIBRATIONS OF STRUCTURES WITH CYCLIC SYMMETRY: APPLICATION TO THE CASE OF TURBINE ENGINES [VIBRATIONS DE STRUCTURES A SYMETRIE CYCLIQUE: APPLICATION AU CAS DES TURBOMACHINES] **c39**
Ludovic Meziere *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p In FRENCH (For primary document see N94-34431 10-07)
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A great number of gas turbine components gives cyclic symmetry properties which may be useful to analyze such parts. The resonance occurrences are numerous because of the different harmonics of the rotational speed. Shift phase characteristics between each periodic sector can be easily used to represent the complex system forces made of air flow distortions for instance. The aerodynamical forces are transmitted to the structure mainly by the blades. From this point, we note under some stationary pressure deviations, fixed in the space reference, that the airfoil undergoes pressure fluctuations during its revolution cycle. This stationary phenomena is periodic in the blade reference. It shows a forward or backward wave propagation whose frequency is determined within each frame. A couple of eigen modes, except under some particular conditions, can be found using cyclic symmetry conditions at exactly the same eigen value. The linear combination of both modes are used to analyze the wave propagation. Resonance conditions are shown in this paper and an assessment of an excitability factor has been introduced to reckon the potentially dangerous modes. This method is applied on a modal analysis of an impeller of a gas turbine engine designed by TURBOMECA. This step is pre-requisite to a complete simulation of dynamic responses incorporating dissipative functions and the aeroelastic coupling which mainly governs such a vibration phenomena. Author

N94-34464# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec). Static Structure Dept.
ENGINE STATIC STRUCTURES BEHAVIOUR UNDER IMPACT LOAD USING 3D MODELLING **c39**
T. Lucas and K. S. Van *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 22 p Original contains color illustrations (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

The 3-D finite element method is used to simulate the structural effects of turbine blade impact on gas turbine engine structural casings and flanges, including both local effects and load transfer to the mounts. The analysis uses United Technologies' code WHAM to determine dynamic impact loads, and commercial codes MARC or MSC/NASTRAN to obtain transient stresses and distortions in the casings. The analysis is compared qualitatively and quantitatively to engine test results. Good correlation is obtained in predicting the observed failure. Author

N94-34465# National Research Council of Canada, Ottawa (Ontario). Structures and Materials Lab.
HOT SECTION MATERIALS FOR SMALL TURBINES
A. K. Koul *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 10 p (For primary document see N94-34431 10-07)
(IAR Proj. CJ501)
Copyright Avail: CASI HC A02/MF A04

This paper reviews unique requirements for hot section materials for small (less than 5000 lb. St.) axial flow turbines. Recent developments in integrally cast wheels, conventionally cast blades and vanes, directionally solidified and single crystal blades, conventionally forged and gatorized discs, and coatings technologies are summarized. Hot section materials trends for future engine designs, particularly in light of USAF MIL-STD-1783 requirements, are also discussed. Author

N94-34466# Sussex Univ., Brighton (England). Thermo-Fluid Mechanics Research Centre.
AN AIR BEARING SYSTEM FOR SMALL HIGH SPEED GAS TURBINES **c37**
A. B. Turner, S. J. Davies, and Y. L. Nimir *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p Sponsored by

Rolls-Royce Ltd. and Aisin Seiki Co. Ltd. (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

This paper describes the second phase of an experimental program concerning the application of air bearings to small turbomachinery test rigs and small gas turbines. The first phase examined externally pressurized (EP) journal bearings, with a novel EP thrust bearing, for application to 'warm air' test rigs, and was entirely successful at rotational speeds in excess of 100,000 rpm. This second phase examined several designs of tilting pad-spiring journal bearings, one with a novel form of externally pressurized pad, but all using the original EP thrust bearing. The designs tested are described, including some oscillogram traces, for tests up to a maximum of 70,000 rpm; the most successful using a carbon pad-titanium beam spring arrangement. The thrust bearing which gave trouble-free operation throughout, is also described. The results of an original experiment to measure the 'runway speed' of a radial inflow turbine are also presented, which show that overspeeds of 58 percent above the design speed can result from free-power turbine coupling failure. Author

N94-34679*# General Motors Corp., Indianapolis, IN. Gas Turbine Div.
COMPOSITE MATRIX EXPERIMENTAL COMBUSTOR Final Technical Report
Marc D. Paskin Apr. 1994 181 p
(Contract NAS3-24226)
(NASA-CR-194446; EDR-16346; NAS 1.26:194446; ARL-TR-334) Avail: CASI HC A09/MF A02

A joint Army/NASA program was conducted to design, fabricate, and test an advanced, reverse-flow, small gas turbine combustor utilizing a compliant metal/ceramic (CMC) wall cooling concept. The objectives of this effort were to develop a design method (basic design data base and analysis) for the CMC cooling technique and then demonstrate its application to an advanced cycle, small, reverse-flow combustor with 3000 F burner outlet temperature (BOT). The CMC concept offers significant improvements in wall cooling effectiveness resulting in a large reduction in cooling air requirements. Therefore more air is available for control of burner outlet temperature pattern in addition to the benefits of improved efficiency, reduced emissions, and smoke levels. Task 1 of the program defined component materials and localized design of the composite wall structure in conjunction with development of basic design models for analysis of flow and heat transfer through the wall. Task 2 required implementation of the selected materials and validated design models during combustor preliminary design. Detail design of the selected combustor concept and its refinement with 3-D aerothermal analysis were completed in Task 3. Task 4 covered detail drawings, process development and fabrication, and a series of burner rig tests. Burner rig tests covered characterization of cold flow pressure drop, lean blowout and ignition mapping steady-state performance throughout the operating range including the milestone 3000 F BOT as well as two series of simulated cyclic thermal shock tests at high point BOT conditions of 2700 F (32 total cycles) and 3000 F (68 total cycles). Rig test results have demonstrated the benefits and viability of the CMC concept, meeting or exceeding the aerothermal performance and liner wall temperature characteristics of similar lower temperature combustors, achieving 0.15 pattern factor at 3000 F BOT while utilizing approximately 80 percent less cooling air than conventional, film-cooled combustion systems. Author

N94-34993*# Coltec Industries, West Hartford, CT. Control Systems Div.
HOT GAS INGESTION EFFECTS ON FUEL CONTROL SURGE RECOVERY AND AH-1 ROTOR DRIVE TRAIN TORQUE SPIKES Final Report, Sep. - Oct. 1992
Frank Tokarski, Mihir Desai, Martin Books, and Raymond Zagranski Apr. 1994 54 p
(Contract NAS3-26075; DA Proj. 1L1-62211-A-47)
(NASA-CR-191047; E-8638; NAS 1.26:191047; ARL-CR-13) Avail: CASI HC A04/MF A01

This report summarizes the work accomplished through computer simulation to understand the impact of the hydromechanical turbine assembly (TA) fuel control on rocket gas ingestion induced engine surges on the AH-1 (Cobra) helicopter. These surges excite the lightly damped torsional modes of the Cobra rotor drive train and can cause overtorqueing of the tail rotor shaft. The simulation studies show that the hydromechanical TA control has a negligible effect on drive train resonances because its response is sufficiently attenuated at the resonant frequencies. However, a digital electronic control working through the TA control's separate, emergency fuel metering system has been identified as a solution to the overtorqueing problem. State-of-the-art software within the electronic control can provide active damping of the rotor drive train to eliminate excessive torque spikes due to any disturbances including engine surges and aggressive helicopter maneuvers. Modifications to the existing TA hydromechanical control are relatively minor, and existing engine sensors can be utilized by the electronic control. Therefore, it is concluded that the combination of full authority digital electronic control (FADEC) with hydromechanical backup using the existing TA control enhances flight safety, improves helicopter performance, reduces pilot workload, and provides a substantial payback for very little investment. Author

N94-33451*# General Electric Co., Cincinnati, OH. Aircraft Engines.
GENERAL ELECTRIC/PRATT AND WHITNEY SUMMARY REPORT
Samuel C. Gilkey and Richard W. Hines *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 137-195 (For primary document see N94-33447 10-02)
Avail: CASI HC A04/MF A04

N94-33463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA HSR PHASE 1 LOW NOISE NOZZLE TECHNOLOGY PROGRAM OVERVIEW
Bernard J. Blaha *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 509-515 (For primary document see N94-33462 10-02)
Avail: CASI HC A02/MF A04

N94-33468*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/LaRC JET PLUME RESEARCH
John M. Seiner, Michael K. Ponton, and James C. Manning *In its* First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 609-644 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33476*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE NASA SPONSORED HSCT PROPULSION STUDIES
William C. Strack *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 813-827 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A NASA LEWIS COMPARATIVE PROPULSION SYSTEM ASSESSMENT FOR THE HIGH-SPEED CIVIL TRANSPORT
Jeffrey J. Berton, William J. Haller, Jonathan A. Seidel, and Paul F. Senick *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 831-865 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33478*# General Electric Co., Cincinnati, OH.
P AND W/GE PROPULSION SYSTEMS STUDIES INTRODUCTION
Samual C. Gilkey and Richard W. Hines *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 869-877 (For primary document see N94-33462 10-02)
Avail: CASI HC A02/MF A04

N94-33479*# General Electric Co., Cincinnati, OH. Aircraft Engines.
RESULTS OF GEAE HSCT PROPULSION SYSTEM STUDIES
Fred H. Krause *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 881-917 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33480*# Pratt and Whitney Aircraft, East Hartford, CT. Advanced Engine Programs.
P AND W PROPULSION SYSTEMS STUDIES RESULTS/STATUS
Martin G. Smith, Jr. and George A. Champagne *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 921-947 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33481*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LOW EMISSIONS COMBUSTOR TECHNOLOGY FOR HIGH-SPEED CIVIL TRANSPORT ENGINES
Richard W. Niedzwiecki *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 953-964 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33486*# Pratt and Whitney Aircraft, East Hartford, CT.
RICH BURN COMBUSTOR TECHNOLOGY AT PRATT AND WHITNEY
Robert P. Lohmann and T. J. Rosfjord *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 1045-1056 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33503*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROPULSION AIRFRAME INTEGRATION SESSION OVERVIEW AND REVIEW OF LEWIS PAI EFFORTS
Peter G. Batterton *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1369-1379 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33507*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
TRANSONIC AIRFRAME PROPULSION INTEGRATION
Robert E. Coltrin, Bobby W. Sanders, and Daniel P. Bencze *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1439-1459 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33510*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT INTEGRATED PROPULSION CONTROL ISSUES
Christopher M. Carlin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1507-1518 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33511*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ENABLING PROPULSION MATERIALS FOR HIGH-SPEED CIVIL TRANSPORT ENGINES
Joseph R. Stephens and Thomas P. Herbell *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1523-1546 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-34607# Wright Lab., Wright-Patterson AFB, OH. Turbine Engine Div.
PROGRESS AND PURPOSE OF IHPTET PROGRAM
Richard J. Hill *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

N94-34608# Rolls-Royce Ltd., Bristol (England).
ENGINE CHARACTERISTICS FOR AGILE AIRCRAFT
K. R. Garwood, G. S. Hodges, and H. E. Rogers *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance.*

N94-33378*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A COMPUTER PROGRAM TO OBTAIN TIME-CORRELATED GUST LOADS FOR NONLINEAR AIRCRAFT USING THE MATCHED-FILTER-BASED METHOD Final Report
Robert C. Scott, Anthony S. Pototzky, and Boyd Perry, III Feb. 1994 46 p
(Contract DTFA03-89-A-00019)
(NASA-TM-109768; NAS 1.15:109768; AD-A278236; DOT/FAA/CT-93/63)
Avail: CASI HC A03/MF A01

NASA Langley Research Center has, for several years, conducted research in the area of time-correlated gust loads for linear and nonlinear aircraft. The results of this work led NASA to recommend that the Matched-Filter-Based One-Dimensional Search Method be used for gust load analyses of nonlinear aircraft. This manual describes this method, describes a FORTRAN code which performs this method, and presents example calculations for a sample nonlinear aircraft model. The name of the code is MFD1DS (Matched-Filter-Based One-Dimensional Search). The program source code, the example aircraft equations of motion, a sample input file, and a sample program output are all listed in the appendices.
DTIC

N94-33543 Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
A HANDLING QUALITIES INVESTIGATION OF CONVENTIONAL, RATE COMMAND AND ATTITUDE HOLD, AND ATTITUDE COMMAND AND ATTITUDE HOLD RESPONSE TYPES IN THE PROBE AND DROGUE AIR REFUELING TASK M.S. Thesis
Michael J. Taschner Mar. 1994 315 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278464; AFIT/GAE/ENY/94M-4) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This investigation examines the suitability of conventional, rate command/attitude hold (RCAH), and attitude command attitude hold (ACAH) response-types for the probe and drogue air refueling task. Data from a 1974 Calspan handling qualities investigation involving conventional response-types in the probe and drogue air refueling task were analyzed using the Bandwidth and STI Dropback criterions. Flight control laws were developed to achieve twelve superaugmented and two conventional configurations. The NT-33A analog variable stability system was used to simulate a relaxed static stability fighter and the NT-33A programmable digital flight control computer simulated the desired response-types. The handling qualities of the fourteen configurations were evaluated during eight flight test sorties. Data consisted of pilot commentary, handling qualities ratings using the Cooper-Harper rating scale, pilot induced oscillation tendency ratings, and turbulence ratings. The bandwidth criterion supplemented with frequency response based control sensitivity metrics successfully correlated the observed handling qualities. Configurations with handling qualities deficiencies were characterized by any one of the following: excessive gain at the pitch and flight path bandwidths, excessive phase delay, low bandwidth, or a gain margin limited pitch attitude bandwidth.
DTIC

N94-33998*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PILOTED SIMULATION STUDY OF TWO TILT-WING FLAP CONTROL CONCEPTS, PHASE 2
Lourdes G. Birckelbaw, Lloyd D. Corliss, William S. Hindson, and Gary B. Churchill Apr. 1994 69 p
(RTOP 505-61-51)
(NASA-TM-108817; A-94072; NAS 1.15:108817) Avail: CASI HC A04/MF A01

A two phase piloted simulation study has been conducted in the Ames Vertical Motion Simulator to investigate alternative wing and flap controls for tilt-wing aircraft. This report documents the flying qualities

results and findings of the second phase of the piloted simulation study and describes the simulated tilt-wing aircraft, the flap control concepts, the experiment design and the evaluation tasks. The initial phase of the study compared the flying qualities of both a conventional programmed flap and an innovative geared flap. The second phase of the study introduced an alternate method of pilot control for the geared flap and further studied the flying qualities of the programmed flap and two geared flap configurations. In general, the pilot ratings showed little variation between the programmed flap and the geared flap control concepts. Some differences between the two control concepts were noticed and are discussed in this report. The geared flap configurations had very similar results. Although the geared flap concept has the potential to reduce or eliminate the pitch control power requirements from a tail rotor or a tail thruster at low speeds and in hover, the results did not show reduced tail thruster pitch control power usage with the geared flap configurations compared to the programmed flap configuration. The addition of pitch attitude stabilization in the second phase of simulation study greatly enhanced the aircraft flying qualities compared to the first phase. Author

N94-34264*# Santa Clara Univ., CA. Dept. of Mechanical Engineering.
VISION-BASED AIRCRAFT GUIDANCE Final Report, 1 Feb. 1993 - 14 Dec. 1993
P. K. Menon Dec. 1993 15 p
(Contract NCC2-793)
(NASA-CR-195937; NAS 1.26:195937) Avail: CASI HC A03/MF A01

Early research on the development of machine vision algorithms to serve as pilot aids in aircraft flight operations is discussed. The research is useful for synthesizing new cockpit instrumentation that can enhance flight safety and efficiency. With the present work as the basis, future research will produce low-cost instrument by integrating a conventional TV camera together with off-the=shelf digitizing hardware for flight test verification. Initial focus of the research will be on developing pilot aids for clear-night operations. Latter part of the research will examine synthetic vision issues for poor visibility flight operations. Both research efforts will contribute towards the high-speed civil transport aircraft program. It is anticipated that the research reported here will also produce pilot aids for conducting helicopter flight operations during emergency search and rescue. The primary emphasis of the present research effort is on near-term, flight demonstrable technologies. This report discusses pilot aids for night landing and takeoff and synthetic vision as an aid to low visibility landing.
Derived from text

N94-34406 Department of the Navy, Washington, DC.
ADAPTIVE AUTOPILOT Patent
Dewey P. Ankeney, inventor (to Navy) 28 Sep. 1993 4 p Filed 20 Jun. 1974
(AD-D016193; US-Patent-5,248,114; US-Patent-Appl-SN-481570; US-Patent-Class-244-3) Avail: US Patent and Trademark Office

An autopilot system is introduced including parameter identification circuits wherein the function of the torque and the function of the translational force on a missile are unknown and varying (including approaching zero).
DTIC

N94-34687*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LAUNCH-PAD ABORT CAPABILITIES OF THE HL-20 LIFTING BODY
E. Bruce Jackson, Robert A. Rivers, Rajiv S. Chowdhry, W. A. Ragsdale, and David W. Geyer May 1994 19 p
(RTOP 505-64-52-01)
(NASA-TM-4550; L-17330; NAS 1.15:4550) Avail: CASI HC A03/MF A01

The capability of the HL-20 lifting body to perform an abort maneuver from the launch pad to a horizontal landing was studied. The study involved both piloted and batch simulation models of the vehicle. A point-mass model of the vehicle was used for trajectory optimization studies. The piloted simulation was performed in the Langley Visual/Motion Simulator in the fixed-base mode. A candidate maneuver was developed and refined for the worst-case launch-pad-to-landing-site geometry with an iterative procedure of off-line maneuver analysis followed by piloted evaluations and heuristic improvements to the candidate maneuver. The resulting maneuver demonstrates the launch-site abort capability of the HL-20 and dictates requirements for nominal abort-motor performance. The sensitivity of the maneuver to variations in several design parameters was documented. Author

N94-34994*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
YAV-8B REACTION CONTROL SYSTEM BLEED AND CONTROL POWER USAGE IN HOVER AND TRANSITION
Paul F. Borchers, Ernesto Moralez, III, Vernon K. Merrick, and Michael W. Stortz Apr. 1994 47 p
(RTOP 533-02-37)
(NASA-TM-104021; A-93080; NAS 1.15:104021) Avail: CASI HC A03/MF A01

Using a calibrated Rolls-Royce Pegasus engine and existing aircraft instrumentation and pressure taps, total and individual nozzle reaction control system (RCS) bleed flow rates have been measured on a YAV-8B Harrier during typical short takeoff, transition, hover, and vertical landing maneuvers. RCS thrust forces were calculated from RCS nozzle total pressure measurements, and control power was determined from the moments produced by these thrusts and the aircraft's moments of inertia. These data document the characteristics of the YAV-8B RCS with its basic stability augmentation system (SAS) engaged. Advanced control system designs for the YAV-8B can be compared to the original SAS based on the total bleed use and the percentage of available bleed used. In addition, the peak and mean values of the bleed and control power data can be used for sizing the reaction controls for a future short takeoff and vertical landing (STOVL) aircraft. Author

N94-34326# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
INTEGRATED FLIGHT/THRUST CONTROL SYSTEMS WITH CONSTANT ANGLE-OF-ATTACK
Yi-Dong Yang and Zhong Yang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 75-79 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34327# Nanjing Aeronautical Inst. (China).
ROBUST VARIABLE STRUCTURE FLIGHT CONTROL SYSTEM
An-Hong Sun and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 80-84 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34328# Nanjing Aeronautical Inst. (China).
AIRCRAFT OPTIMAL VARIABLE STRUCTURE CONTROL SYSTEM
An-Hong Sun and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 85-89 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34329# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE DECOUPLING DESIGN OF AIRCRAFT LATERAL FLIGHT CONTROL SYSTEMS WITH EIGENSTRUCTURE ASSIGNMENT
Shu-Fan Wu and Suo-Feng Guo *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 90-94 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34330# Nanjing Aeronautical Inst. (China).
H INFINITY OPTIMAL DESIGN OF ROBUST FLIGHT CONTROL SYSTEM
Chang-Sheng Jiang, Chun-Lin Shen, Chang-Yin Zhang, and Dai-Ye Lin *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 95-98 Sponsored by National Natural Science Foundation of China (For primary document

see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34331# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE TRACKING CONTROL OF NONLINEAR UNCERTAIN SYSTEMS
Xiao Liu, Jin-Quan Huang, and Ju Jiang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 99-103 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34332# Beijing Inst. of Tech. (China).
FAST ADAPTIVE CONTROL AND ITS APPLICATION TO MISSILE GUIDANCE
Ting-Li Kang and Zhi-Yong Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 104-109 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34337# Hankuk Aviation Univ., Kyunggido (Republic of Korea). Dept. of Aeronautical and Mechanical Engineering.
TRIM CALCULATION OF TANDEM ROTOR HELICOPTER USING SIMPLIFIED ROTOR SYSTEM MATHEMATICAL MODEL
Myoung-Shin Hwang and Kang-Woong Lee *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 126-130 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34613# Defence Research Agency, Farnborough (England). Aerodynamics and Propulsion Dept.
DYNAMIC TESTS TO DEMONSTRATE LATERAL CONTROL USING FOREBODY SUCTION ON LARGE SCALE MODELS IN THE DRA 24 FOOT WIND TUNNEL
Geraldine F. Edwards, A. Jean Ross, Edward B. Jefferies, and Charles O. OLeary *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 14 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A03/MF A03

N94-34615# Bath Univ. (England). School of Mechanical Engineering.
YAW CONTROL BY TANGENTIAL FOREBODY BLOWING
N. J. Wood and W. J. Crowther *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 10 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

N94-34616# Defence Research Agency, Bedford (England).
CONTROL OF LEADING-EDGE SEPARATION ON A CAMBERED DELTA WING
P. R. Ashill and G. L. Riddle *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 13 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A03/MF A03

N94-34618# Deutsche Aerospace A.G., Munich (Germany). Military Aircraft Group.
X-31A CONTROL LAW DESIGN
H. Beh and G. Hofinger *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 9 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

N94-34619# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugmechanik.
X-31A SYSTEM IDENTIFICATION APPLIED TO POST-STALL FLIGHT: AERODYNAMICS AND THRUST VECTORING
D. Rohlf, E. Plastschke, and S. Weiss *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 12 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A03/MF A03

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N94-33424 Naval Surface Warfare Center, Dahlgren, VA.
HYPERVELOCITY TUNNEL 9 MACH 8 CALIBRATION
Nancy F. Swinford 10 Mar. 1994 47 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277575; NSWCDD/TR-93/40) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report documents the Mach 8 Calibration test program (WTR 1614) performed in the Navy's Hypervelocity Wind Tunnel (Tunnel 9). This was an in-house calibration test effort. Free stream flow field measurements were obtained for the Mach 8 nozzle, covering a wide range of Reynolds numbers. The calibration included running very low Reynolds numbers, not previously calibrated at Mach 8, as well as running at the current maximum supply conditions for Mach 8. The test period was 18 to 23 December 1992, with a total of five runs. Results from this test entry were combined with previous Mach 8 calibration data in the final analysis. Previous calibration data were taken when Mach 8 was originally brought on-line in December of 1988. The maximum supply conditions were lower during the original calibration than are currently available. However, data from this most recent calibration reveal that high quality uniform flow still exists and that deviations in core flow field parameters are comparable with other Tunnel 9 calibration data taken to date. DTIC

N94-33444 Army Engineer Waterways Experiment Station, Vicksburg, MS. Geotechnical Lab.
CONTINGENCY AIRFIELD CONSTRUCTION: MECHANICAL STABILIZATION USING MONOFILAMENT AND FIBRILLATED FIBERS Final Report
Randy C. Ahlrich and Lee E. Tidwell Jan. 1994 53 p Sponsored by Wright Lab. Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277732; WES/TR-GL-94-2) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report documents a laboratory study that evaluated the effectiveness of mechanically stabilizing low strength soils with monofilament and fibrillated fibers. The study provides guidance on fiber type, length, and dosage rate to produce stabilized soils for contingency airfield construction. This study included a review of available literature and a two-phase laboratory test program. The basis of this study was to determine the feasibility of using fibers to significantly enhance the strength of low-strength soils. The soil materials used in the laboratory study were a high plasticity clay (CH) and a beach sand (SP). Each soil was tested to determine the optimum moisture content, maximum dry density, and soaked and as-molded CBR strengths. The clay and sand materials were then stabilized with monofilament and fibrillated fibers at various lengths and dosages. These stabilized materials were then evaluated with the Corps of Engineers gyratory testing machine to determine gyratory shear strength properties. The stabilized soils that indicated an increase in gyratory shear strength were evaluated with the laboratory CBR procedure to determine the soaked and as-molded CBR strength values. The findings of this study indicated that the monofilament fibers can improve strength values of beach sand and the fibrillated fibers can improve the strength values of a high plasticity clay. This laboratory study also indicated that the CBR test may not evaluate the effectiveness of fiber stabilization. DTIC

N94-33538 MiTech, Inc., Pleasantville, NJ.
IMPROVED TAXIWAY EXIT IDENTIFICATION SYSTEM
Eric Katz and Thomas Paprocki Feb. 1994 28 p Sponsored by FAA Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A277892; DOT/FAA/CT-TN93/49) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A prototype enhanced visual taxiway identification system, consisting of a segment of green lights imbedded within the conventional runway centerline lighting system, was developed and tested at the Federal Aviation Administration (FAA) Technical Center. Results of the combined developmental/evaluational effort indicated that the system may be expected to provide enhanced and effective identification of taxiway exit locations at minimum cost. DTIC

N94-33570* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.

HIGH HEAT FLUX FACILITY (Videotape)

1993 Videotape: 4 min. 50 sec. playing time, in color, with sound
(NASA-TM-109834; NONP-VT-94-12962) Avail: CASI VHS A01/BETA A22

This video gives an overview of the High Heat Flux Facility being built at Stennis Space Center in conjunction with Wright-Patterson Air Force Base. This facility will simulate flight heat conditions and will be used to test engine and materials for the National Aerospace Plane. CASI

N94-33604*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

POWERED LIFT FACILITY AT NASA LEWIS RESEARCH CENTER'S AEROACOUSTIC PROPULSION LABORATORY

Gail P. Perusek Jun. 1994 19 p Presented at the 18th Aerospace Ground Test Conference, Colorado Springs, CO, 20-23 Jun. 1994; sponsored by AIAA
(RTOP 505-62-84)
(NASA-TM-106577; E-8830; NAS 1.15:106577; AIAA Paper 94-2560)
Avail: CASI HC A03/MF A01

The Powered Lift Facility (PLF) is a unique and valuable ground test facility at the NASA Lewis Research Center designed to accommodate several types of test programs that support the analytical and experimental research on supersonic short-takeoff and vertical-landing (SSTOVL) aircraft. Major systems of the PLF are discussed: thrust balance, air supply, mass flow measuring, instrumentation and data acquisition, and auxiliary support. For potential users of the PLF, details are given about the requirements for model design, instrumentation, and deliverables. Author

N94-33751* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ICING RESEARCH TUNNEL (Videotape)

Jan. 1990 Videotape: 7 min. 39 sec. playing time, in color, with sound
(NASA-TM-109844; Rept-4001; NONP-VT-94-13534) Avail: CASI VHS A01/BETA A22

This video gives the history of the Icing Research Tunnel at LeRC and how it is used today to understand and protect against icing. CASI

N94-34071*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY Summary Report

29 Apr. 1994 36 p Prepared in cooperation with DOD, Washington, DC; Commerce Dept., Washington, DC; DOE, Washington, DC; and DOT, Washington, DC
(NASA-TM-109851; NAS 1.15:109851) Avail: CASI HC A03/MF A01

This study provides a set of recommendations for improving the effectiveness of our nation's aeronautics and space facilities. The study plan considers current and future government and commercial needs as well as DOD and NASA mission requirements through the year 2023. It addresses shortfalls in existing capabilities, new facility requirements, upgrades, consolidations, and phase-out of existing facilities. If the recommendations are implemented, they will provide world-class capability where it is vital to our country's needs and make us more efficient in meeting future needs. Derived from text

N94-34104# Federal Aviation Administration, Washington, DC. Research and Development.

SAFE HELIPORTS THROUGH DESIGN AND PLANNING Final Report

Robert D. Smith Feb. 1994 122 p
(DOT/FAA/RD-93/17) Avail: CASI HC A06/MF A02

During the last decade, the Federal Aviation Administration (FAA) has published several dozen research and development (R&D) reports dealing with the planning and design of landing sites for vertical flight aircraft. These landing sites include helipads at airports, heliports, helistops, vertiports, and unimproved sites. Vertical flight aircraft include helicopters, tiltrotor, and tiltwing. These reports would make a stack that is several feet high. Airport, heliport, and vertiport planners and designers should be familiar with FAA R&D efforts in this area. We recognize, however, that many people do not have the time to read all of the published material. In addition, without a 'road map' through all of this material, it may be difficult to see how multiple documents fit together to tell a coherent story on a particular subject of interest. With this in mind, the FAA has prepared this summary to assist you in becoming familiar with the results of these efforts. Author

N94-34632*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 1: FACILITIES INVENTORY

29 Apr. 1994 49 p
(NASA-TM-109854; NAS 1.15:109854) Avail: CASI HC A03/MF A01

The inventory activity was initiated to solve the critical need for a single source of site specific descriptive and parametric data on major public and privately held aeronautics and aerospace related facilities. This a challenging undertaking due to the scope of the effort and the short lead time in which to assemble the inventory and have it available to support the task group study needs. The inventory remains dynamic as sites are being added and the data is accessed and refined as the study progresses. The inventory activity also included the design and implementation of a computer database and analytical tools to simplify access to the data. This volume describes the steps which were taken to define the data requirements, select sites, and solicit and acquire data from them. A discussion of the inventory structure and analytical tools is also provided. Derived from text

N94-34633*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 2: TASK GROUP ON AERONAUTICAL RESEARCH AND DEVELOPMENT FACILITIES REPORT

29 Apr. 1994 413 p
(NASA-TM-109855; NAS 1.15:109855) Avail: CASI HC A18/MF A04

The Task Group on Aeronautics R&D Facilities examined the status and requirements for aeronautics facilities against the competitive need. Emphasis was placed on ground-based facilities for subsonic, supersonic and hypersonic aerodynamics, and propulsion. Subsonic and transonic wind tunnels were judged to be most critical and of highest priority. Results of the study are presented. Derived from text

N94-34634*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 2A: FACILITY STUDY OFFICE ON THE NATIONAL WIND TUNNEL COMPLEX Final Report

29 Apr. 1994 864 p
(NASA-TM-109856; NAS 1.15:109856) Avail: CASI HC A99/MF A10

The Facility Study Office (FSO) has completed its assigned activities. The results of the FSO efforts, studies, and assessments are documented. An overview of the FSO activities as well as a general comparison of all concepts considered are provided. Detailed information is also provided for the selected concept, Concept D-Option 5. Only findings are presented. The FSO developed recommendations only as a consequence of assumptions for cost and schedule assessments. Derived from text

N94-34635*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 3: MISSION AND REQUIREMENTS MODEL REPORT Final Report

29 Apr. 1994 102 p
(NASA-TM-109857; NAS 1.15:109857) Avail: CASI HC A06/MF A02

The National Facility Study (NFS) was initiated in 1992 by Daniel S. Goldin, Administrator of NASA as an initiative to develop a comprehensive and integrated long-term plan for future facilities. The resulting, multi-agency NFS consisted of three Task Groups: Aeronautics, Space Operations, and Space Research and Development (R&D) Task Groups. A fourth group,

the Engineering and Cost Analysis Task Group, was subsequently added to provide cross-cutting functions, such as assuring consistency in developing an inventory of space facilities. Space facilities decisions require an assessment of current and future needs. Therefore, the two task groups dealing with space developed a consistent model of future space mission programs, operations and R&D. The model is a middle ground baseline constructed for NFS analytical purposes with excursions to cover potential space program strategies. The model includes three major sectors: DOD, civilian government, and commercial space. The model spans the next 30 years because of the long lead times associated with facilities development and usage. This document, Volume 3 of the final NFS report, is organized along the following lines: Executive Summary -- provides a summary view of the 30-year mission forecast and requirements baseline, an overview of excursions from that baseline that were studied, and organization of the report; Introduction -- provides discussions of the methodology used in this analysis; Baseline Model -- provides the mission and requirements model baseline developed for Space Operations and Space R&D analyses; Excursions from the baseline -- reviews the details of variations or 'excursions' that were developed to test the future program projections captured in the baseline; and a Glossary of Acronyms. Derived from text

N94-34636*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 4: SPACE OPERATIONS FACILITIES TASK GROUP Final Report

29 Apr. 1994 590 p

(NASA-TM-109858; NAS 1.15:109858) Avail: CASI HC A25/MF A06

The principal objectives of the National Facilities Study (NFS) were to: (1) determine where U.S. facilities do not meet national aerospace needs; (2) define new facilities required to make U.S. capabilities 'world class' where such improvements are in the national interest; (3) define where consolidation and phase-out of existing facilities is appropriate; and (4) develop a long-term national plan for world-class facility acquisition and shared usage. The Space Operations Facilities Task Group defined discrete tasks to accomplish the above objectives within the scope of the study. An assessment of national space operations facilities was conducted to determine the nation's capability to meet the requirements of space operations during the next 30 years. The mission model used in the study to define facility requirements is described in Volume 3. Based on this model, the major focus of the Task Group was to identify any substantive overlap or underutilization of space operations facilities and to identify any facility shortfalls that would necessitate facility upgrades or new facilities. The focus of this initial study was directed toward facility recommendations related to consolidations, closures, enhancements, and upgrades considered necessary to efficiently and effectively support the baseline requirements model. Activities related to identifying facility needs or recommendations for enhancing U.S. international competitiveness and achieving world-class capability, where appropriate, were deferred to a subsequent study phase. Derived from text

N94-34637*# National Aeronautics and Space Administration, Washington, DC.

NATIONAL FACILITIES STUDY. VOLUME 5: SPACE RESEARCH AND DEVELOPMENT FACILITIES TASK GROUP Final Report

29 Apr. 1994 211 p

(NASA-TM-109859; NAS 1.15:109859) Avail: CASI HC A10/MF A03

With the beginnings of the U.S. space program, there was a pressing need to develop facilities that could support the technology research and development, testing, and operations of evolving space systems. Redundancy in facilities that was once and advantage in providing flexibility and schedule accommodation is instead fast becoming a burden on scarce resources. As a result, there is a clear perception in many sectors that the U.S. has many space R&D facilities that are under-utilized and which are no longer cost-effective to maintain. At the same time, it is clear that the U.S. continues to possess many space R&D facilities which are the best -- or among the best -- in the world. In order to remain world class in key areas, careful assessment of current capabilities and planning for new facilities is needed. The National Facility Study (NFS) was initiated in 1992 to develop a comprehensive and integrated long-term plan for future aerospace facilities that meets current and projected government and commercial needs. In order to assess the nation's capability to support space research and development (R&D), a Space R&D Task Group was formed. The Task Group was co-chaired by NASA and DOD. The Task Group formed four major, technologically- and functionally- oriented working groups: Human and Machine Operations; Information and Communications; Propulsion and Power; and Materials, Structures, and Flight Dynamics. In addition to these groups, three supporting working groups were formed: Systems Engineering and Requirements; Strategy and Policy; and Costing Analysis. The Space R&D Task Group examined several hundred facilities against the template of a baseline mission and requirements model (developed in common with the Space Operations Task Group) and a set of excursions from the baseline. The model and excursions are described in Volume 3 of the NFS final report. In addition, as a part of the effort, the group examined key strategic issues associated with space R&D facilities planning for the U.S., and these are discussed in Section 4 of this volume. Derived from text

N94-34919*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

FLOW QUALITY STUDIES OF THE NASA LEWIS RESEARCH CENTER ICING RESEARCH TUNNEL

E. Allen Arrington (NYMA, Inc., Brook Park, OH.), Mark T. Pickett, and David W. Sheldon Jun. 1994 44 p Presented at the 18th Aerospace Ground Testing Conference, Colorado Springs, CO, 20-23 Jun. 1994; sponsored by AIAA

(Contract NAS3-25266; RTOP 505-62-84)

(NASA-TM-106545; E-8691; NAS 1.15:106545; AIAA Paper 94-2590)

Avail: CASI HC A03/MF A01

A series of studies have been conducted to determine the flow quality in the NASA Lewis Icing Research Tunnel. The primary purpose of these studies was to document airflow characteristics, including flow angularity, in the test section and tunnel loop. A vertically mounted rake was used to survey total and static pressure and two components of flow angle at three axial stations within the test section (test section inlet, test plane, and test section exit; 15 survey stations total). This information will be used to develop methods of improving the aerodynamic and icing characteristics within the test section. The data from surveys made in the tunnel loop were used to determine areas where overall tunnel flow quality and efficiency can be improved. A separate report documents similar flow quality surveys conducted in the diffuser section of the Icing Research Tunnel. The flow quality studies were conducted at several locations around the tunnel loop. Pressure, velocity, and flow angularity measurements were made by using both fixed and translating probes. Although surveys were made throughout the tunnel loop, emphasis was placed on the test section and tunnel areas directly upstream of the test section (settling chamber, bellmouth, and cooler). Flow visualization, by video recording smoke and tuft patterns, was also used during these studies. A great deal of flow visualization work was conducted in the area of the drive fan. Information gathered there will be used to improve the flow quality upstream and downstream of the fan. Author

N94-34630# Naval Air Warfare Center, Warminster, PA. Flight Dynamics and Controls Branch.

APPLICATION OF CENTRIFUGE BASED DYNAMIC FLIGHT SIMULATION TO ENHANCED MANEUVERABILITY RDT/E

J. F. Calvert and D. A. Kiefer *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 16 p (For primary document see N94-34605 10-05)

Copyright Avail: CASI HC A03/MF A03

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N94-33566* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

APOLLO 11: THE GODDARD CONNECTION (Videotape)

Jul. 1989 Videotape: 15 min. playing time, in color, with sound

(NASA-TM-109815; NONP-VT-94-12943) Avail: CASI VHS A01/BETA A22

The history of NASA Goddard Space Flight Center's involvement in the Apollo 11 Mission to the Moon is recounted. Goddard maintained the

Manned Space Flight Network, composed of ground tracking stations, and tracking stations aboard ships and airplanes, which maintained communications between the orbiter and Earth. CASI

N94-33574* Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
ULYSSES: A SOLAR ODYSSEY (Videotape)
23 Jul. 1990 Videotape: 11 min. 33 sec. playing time, in color, with sound
(NASA-TM-109820; NONP-VT-94-12948) Avail: CASI VHS A01/BETA A22

This is a film to film transfer of a Media Four production by Charles Finance about the Ulysses Mission to the Sun. The prelaunch production uses graphics, animation, and live footage to describe how Ulysses will use the gravity of Jupiter to lift it out of the ecliptic plane into polar orbit around the Sun. CASI

N94-33576* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ASTRONAUTS NUMBER 3, PART 2 (Videotape)
Sep. 1988 See also N94-15501 Videotape: 28 min. 54 sec. playing time, in color, with sound
(NASA-TM-109822; NONP-VT-94-12950) Avail: CASI VHS A01/BETA A22

This video reviews John Glenn's flight into space. It is a re-release of 'The Flight of Friendship 7'. CASI

N94-33577* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA IMAGES 14 (Videotape)
10 May 1988 Videotape: 29 min. playing time, in color, with sound
(NASA-TM-109823; NONP-VT-94-12951) Avail: CASI VHS A01/BETA A22

This video looks at the Apollo 15 mission to the Appenine Mountains. CASI

N94-33578* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA IMAGES 15 (Videotape)
13 May 1988 Videotape: 27 min. 44 sec. playing time, in color, with sound
(NASA-TM-109824; NONP-VT-94-12952) Avail: CASI VHS A01/BETA A22

This video covers the Apollo 16 mission to the Decartes region. CASI

N94-35116# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: CENTRAL EURASIA. AVIATION AND COSMONAUTICS, NO. 3, MARCH 1993
12 Jan. 1994 17 p Transl. into ENGLISH from various Russian articles
(JPRS-UAC-94-002) Avail: CASI HC A03/MF A01

The translated articles cover the following topics: Russian flight-testing procedures, duration compared to American; Zenit reconnaissance satellites described; and Interkosmos-25 satellite pair studies ionosphere and magnetosphere. Author

N94-35117# Joint Publications Research Service, Arlington, VA.
JPRS REPORT. CENTRAL EURASIA: AVIATION AND COSMONAUTICS, NO. 2, FEBRUARY 1993
3 Jan. 1994 26 p Transl. into ENGLISH from various Russian articles
(JPRS-UAC-94-001) Avail: CASI HC A03/MF A01

Translated articles cover the following topics: method proposed for evaluating utilization of aircraft service life; GEO-1K satellite system for research and geodesic support; and history of Soviet lunar program after N1-L3. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

N94-33558* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
STENNIS SPACE CENTER 1992 (Videotape)
1992 Videotape: 9 min. 45 sec. playing time, in color, with sound
(NASA-TM-109796; NONP-VT-94-12924) Avail: CASI VHS A01/BETA A22

The history and a description of the John C. Stennis Space Center is presented. CASI

N94-33560* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE MAKING OF THE TIME CAPSULE (Videotape)
Jan. 1991 Videotape: 7 min. 55 sec. playing time, in color, with sound
(NASA-TM-109807; NONP-VT-94-12935) Avail: CASI VHS A01/BETA A22

This video highlights the celebration of NASA Lewis Research Center's 50th anniversary celebrations. To commemorate this event, employees designed and manufactured a statue that contains a time capsule. The design process is shown, as well as the unveiling ceremony which features speeches by the center director and local dignitaries. CASI

N94-33567* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
JOHN C. STENNIS SPACE CENTER OVERVIEW (Videotape)
May 1994 Videotape: 11 min. playing time, in color, with sound
(NASA-TM-109816; NONP-VT-94-12944) Avail: CASI VHS A01/BETA A22

An overview of research being conducted at the John C. Stennis Space Center is given. The Space Center is not only a NASA Space Flight Center, but also houses facilities for 22 other governmental agencies. The programs described are Stennis' High Heat Flux Facility, the Component Test Facility (used to test propulsion rockets and for the development of the National Aerospace Plane), oceanographic and remote sensing research, and contributions to the development of Space Station Freedom. CASI

N94-33585* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STATE OF THE CENTER (Videotape)
1992 Videotape: 2 min. 46 sec. playing time, in color, with sound
(NASA-TM-109831; NONP-VT-94-12959) Avail: CASI VHS A01/BETA A22

An overview of events at LeRC is presented. Included are the construction of new facilities, educational outreach programs, and research. CASI

N94-33771* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
WAY STATION TO SPACE: THE HISTORY OF STENNIS SPACE CENTER (Videotape)
[1994] Videotape: 25 min. playing time, in color, with sound
(NASA-TM-109819; NONP-VT-94-12947) Avail: CASI VHS A01/BETA A22

The video traces the history of the Stennis Space Center from its origins as a test facility for President Kennedy's initiative to put a man on the moon to its present day tasks as a leading center for propulsion research and its contributions towards the development or Space Station Freedom. CASI

N94-34131*# NYMA, Inc., Brook Park, OH.
A VERSATILE ROCKET ENGINE HOT GAS FACILITY Final Report
James M. Green Jun. 1993 9 p
(Contracts NAS3-25266; NAS3-21786; RTOP 584-03-11)
(NASA-CR-195339; E-8900; NAS 1.26:195339; AIAA Paper 94-2487)
Avail: CASI HC A02/MF A01

The capabilities of a versatile rocket engine facility, located in the Rocket Laboratory at the NASA Lewis Research Center, are presented. The gaseous hydrogen/oxygen facility can be used for thermal shock and hot gas testing of materials and structures as well as rocket propulsion testing. Testing over a wide range of operating conditions in both fuel and oxygen rich regimes can be conducted, with cooled or uncooled test specimens. The size and location of the test cell provide the ability to conduct large amounts of testing in short time periods with rapid turnaround between programs. Author

N94-34395*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
PARTIAL GRAVITY SIMULATION USING A PNEUMATIC ACTUATOR WITH CLOSED LOOP MECHANICAL AMPLIFICATION
David M. Ray Jun. 1994 40 p
(NASA-TM-104798; S-772; NAS 1.15:104798) Avail: CASI HC A03/MF A01

To support future manned missions to the surface of the Moon and Mars or missions requiring manipulation of payloads and locomotion in space, a training device is required to simulate the conditions of both partial and microgravity as compared to the gravity on Earth. The focus of this paper is to present the development, construction, and testing of a partial gravity simulator which uses a pneumatic actuator with closed loop mechanical amplification. Results of the testing show that this type of simulator maintains a constant partial gravity simulation with a variation of the simulated body force between 2.2 percent and 10 percent, depending on the type of locomotion inputs. The data collected using the simulator show that mean stride frequencies at running speeds at lunar and Martian gravity levels are 12 percent less than those at Earth gravity. The data also show that foot/ground reaction forces at lunar and Martian gravity are, respectively, 62 percent and 51 percent less than those on Earth. Author

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

N94-33423*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
DEBRIS/ICE/TPS ASSESSMENT AND INTEGRATED PHOTOGRAPHIC ANALYSIS FOR SHUTTLE MISSION STS-62 Final Report, 2-21 Mar. 1994
Gregory N. Katnik, Barry C. Bowen, J. Bradley Davis, Robert F. Speece, and Jorge E. Rivera May 1994 138 p Original contains color illustrations
(NASA-TM-109201; NAS 1.15:109201) Avail: CASI HC A07/MF A02; 56 functional color pages

A pre-launch debris inspection of the pad and Shuttle vehicle was conducted on 2 March 1994. The detailed walkdown of Launch Pad 39B and MLP-1 also included the primary flight elements OV-102 Columbia (16th flight), ET-62 (LWT 55), and BI-064 SRB's. There were no significant facility or vehicle anomalies. After the launch on March 4th, a debris inspection of Pad 39B was performed. Damage to the pad overall was minimal. On-orbit photographs taken by the flight crew and two films from the ET/ORB umbilical cameras of the External Tank after separation from the Orbiter revealed no major damage or lost flight hardware that would have been a safety of flight concern. Orbiter performance on final approach appeared normal. Infrared imagery of landing gear deployment showed the loss of thermal barrier from the nose gear wheel well. The missing thermal barrier material was not recovered. The Solid Rocket Boosters were inspected at Hanger AF after retrieval. Both frustums had a combined total of 44 MSA-2 debonds over fasteners. Significant amounts of BTA had been applied to closeouts on the RH frustum, forward skirt, and aft skirt. Hypalon paint was blistered/missing over the areas were the BTA had been applied. The underlying BTA was not sooted (IFA STS-62-B-1). Investigation of this condition has concluded there was insufficient heat rates to cause blistering of the Hypalon until late in the ascent phase. A post landing inspection of OV-102 was conducted after the landing at KSC. The Orbiter TPS sustained a total of 97 hits, of which 16 had a major dimension of 1 inch or larger. The Orbiter lower surface had a total of 36 hits, of which 7 had a major dimension of 1 inch or larger. Based on these numbers and comparison to statistics from previous missions of similar configuration, both the total number of debris hits and the number of hits 1 inch or larger was less than average. Six thermal barriers, total size approximately 36 in. x 3 in. x 1.5 in., and one corner tile piece 4 in. x 4 in., were missing from the nose landing gear doors. Runway infrared cameras recorded these objects falling from the Orbiter when the nose landing gear doors were opened on final approach. A search of the area under the flight path failed to recover the missing thermal batteries, which may be submerged in the large body of water south of the runway. The cause for the loss of the material was attributed to the way the substrate was prepared for bonding at the vendor. Orbiter post landing microchemical sample results revealed a variety of residuals in the Orbiter window samples. These were attributed to SRB BSM exhaust, Orbiter TPS, window protective covers and processing, natural landing site products, and paints/primers from various sources. The residual sampling data do not indicate a single source of damaging debris and all of these materials have been documented previously in analyses for post landing sample reports. Data from residual sampling also showed no trends when compared to previous mission data. A total of ten Post Launch Anomalies, including one IFA, were observed during the STS-62 mission assessment. Derived from text

N94-33571* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
STS-59/SRL-1 (Videotape)
20 Apr. 1994 Videotape: 58 min. playing time, in color, with sound
(NASA-TM-109837; NONP-VT-94-12965) Avail: CASI VHS A01/BETA A22

This video covers the STS-59 mission. Video segments include breakfast, suit-up, departure, launch, on-orbit operations, and landing. CASI

N94-33599* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STS-57 POST FLIGHT PRESS CONFERENCE (Videotape)
1994 Videotape: 21 min. 45 sec. playing time, in color, with sound
(NASA-TM-109838; NONP-VT-94-12966) Avail: CASI VHS A01/BETA A22

This video contains footage selected and narrated by crew members. CASI

N94-33788* National Aeronautics and Space Administration, Washington, DC.
SHUTTLE 51L: CHALLENGER (Videotape)
[1994] Videotape: 45 min. playing time, in color, with sound
(NASA-TM-109835; NONP-VT-94-12963) Avail: CASI VHS A01/BETA A22

This video follows the pre-launch and launch of the Space Shuttle Challenger preceding the accident. It then details the accident investigation report. CASI

N94-34911*# Rockwell International Corp., Huntsville, AL. Space Systems Div.
ADVANCED TRANSPORTATION SYSTEM STUDY: MANNED LAUNCH VEHICLE CONCEPTS FOR TWO WAY TRANSPORTATION SYSTEM PAYLOADS TO LEO. WORK BREAKDOWN STRUCTURE AND WORK BREAKDOWN STRUCTURE DICTIONARY
James B. Duffy 1992 18 p
(Contract NAS8-39207)
(NASA-CR-193952; NAS 1.26:193952; SSD92M0023-1) Avail: CASI HC A03/MF A01

The report describes the work breakdown structure (WBS) and its associated WBS dictionary for task area 1 of contract NAS8-39207, advanced transportation system studies (ATSS). This WBS format is consistent with the preliminary design level of detail employed by both task area 1 and task area 4 in the ATSS study and is intended to provide an estimating structure for parametric cost estimates. Derived from text

N94-34912*# Rockwell International Corp., Huntsville, AL. Space Systems Div.
ADVANCED TRANSPORTATION SYSTEM STUDY: MANNED LAUNCH VEHICLE CONCEPTS FOR TWO WAY TRANSPORTATION SYSTEM PAYLOADS TO LEO. PROGRAM COST ESTIMATES DOCUMENT Final Report
James B. Duffy 1993 38 p
(Contract NAS8-39207)
(NASA-CR-193953; NAS 1.26:193953; SSD93M0026-1) Avail: CASI HC A03/MF A01

This report describes Rockwell International's cost analysis results of manned launch vehicle concepts for two way transportation system payloads to low earth orbit during the basic and option 1 period of performance for contract NAS8-39207, advanced transportation system studies. Vehicles analyzed include the space shuttle, personnel launch system (PLS) with advanced launch system (ALS) and national launch system (NLS) boosters, foreign launch vehicles, NLS-2 derived launch vehicles, liquid rocket booster (LRB) derived launch vehicle, and cargo transfer and return vehicle (CTRV). CASI

17 SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N94-33722 Department of the Navy, Washington, DC.
TELEMETRY DATA WORD SELECTOR AND PROCESSOR Patent
Harold A. Duffy, inventor (to Navy) 14 Dec. 1993 19 p Filed 20 Sep. 1991
(AD-D016174; US-Patent-5,270,705; US-Patent-Appl-SN-764556; US-Patent-Class-340-870.13) Avail: US Patent and Trademark Office

A telemetry word selector and processor device having several digital-to-analog converters (DAC's) receives successive data words each accompanied by a tag word identifying a parameter set in the data word. The device has a tag memory storing, for each possible tag word, a DAC select word having a bit for each DAC and has a bit map memory storing for each DAC a word having a field for each DAC input bit. Each field can address any bit of a data word and has a control bit determining whether the bit is to be unchanged, zeroed, or inverted. The tag memory is addressed by the tag word to output the corresponding word to select DAC's to receive data. The map memory words are output successively, and each field selects a data word bit, as affected by the control bit, for a DAC input word. This word is output to the DAC corresponding to each map memory word if the DAC is selected by the addressed tag memory word. DTIC

N94-34215*# TRW, Inc., Redondo Beach, CA. Space Communications Div.
MULTICHANNEL DEMULTIPLEXER-DEMODULATOR Final Report
Hector Courtois, Mike Sherry, Peter Cangiane, and Greg Caso Nov. 1993 186 p
(Contract NAS3-25866; RTOP 506-72-21)
(NASA-CR-191201; E-8189; NAS 1.26:191201) Avail: CASI HC A09/MF A02

One of the critical satellite technologies in a meshed VSAT (very small aperture terminal) satellite communication networks utilizing FDMA (frequency division multiple access) uplinks is a multichannel demultiplexer/demodulator (MCDD). TRW Electronic Systems Group developed a proof-of-concept (POC) MCDD using advanced digital technologies. This POC model demonstrates the capability of demultiplexing and demodulating multiple low to medium data rate FDMA uplinks with potential for expansion to demultiplexing and demodulating hundreds to thousands of narrowband uplinks. The TRW approach uses baseband sampling followed by successive wideband and narrowband channelizers with each channelizer feeding into a multirate, time-shared demodulator. A full-scale MCDD would consist of an 8 bit A/D sampling at 92.16 MHz, four wideband channelizers capable of demultiplexing eight wideband channels, thirty-two narrowband channelizers capable of demultiplexing one wideband signal into 32 narrowband channels, and thirty-two multirate demodulators. The POC model consists of an 8 bit A/D sampling at 23.04 MHz, one wideband channelizer, 16 narrowband channelizers, and three multirate demodulators. The implementation loss of the wideband and narrowband channels is 0.3dB and 0.75dB at 10(exp -7) E(sub b)/N(sub o) respectively. Author

N94-34051*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
DISCOVERING OPERATING MODES IN TELEMETRY DATA FROM THE SHUTTLE REACTION CONTROL SYSTEM
Stefanos Manganaris (Vanderbilt Univ., Nashville, TN.), Doug Fisher (Vanderbilt Univ., Nashville, TN.), and Deepak Kulkarni *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 234-244 (For primary document see N94-34019 10-99)
(Contract NCC2-645)
Avail: CASI HC A03/MF A04

N94-35069*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A DISTRIBUTED COMPUTING MODEL FOR TELEMETRY DATA PROCESSING
Matthew R. Barry (Rockwell Space Operations Co., Houston, TX.), Kevin L. Scott, and Steven P. Weismuller *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 319-328 (For primary document see N94-35043 10-63)
Avail: CASI HC A02/MF A03

N94-35070*# Aerospace Corp., El Segundo, CA. Computer Systems Div.
ISTAR: INTELLIGENT SYSTEM FOR TELEMETRY ANALYSIS IN REAL-TIME
Charles Simmons *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 329-342 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

N94-33383 Stanford Univ., CA.
EXPERIMENTS IN AUTONOMOUS NAVIGATION AND CONTROL OF MULTI-MANIPULATOR, FREE-FLYING SPACE ROBOTS Ph.D. Thesis
Marc Albert Ullman 1993 338 p
Avail: Univ. Microfilms Order No. DA9317806

Although space presents an exciting frontier for science and manufacturing, it has proven to be a costly and dangerous place for humans. It is an ideal environment for sophisticated robots capable of performing tasks that currently require the active participation of astronauts. The Aerospace Robotics Laboratory, working with NASA, has developed an experimental model of a multimanipulator, free-flying space robot capable of capturing and manipulating free-floating objects without human assistance. The experimental robot model uses air-cushion technology to simulate, in two dimensions, the drag-free, zero-g characteristics of space. Fully self-contained, the vehicle/manipulator system is equipped with gas-jet thrusters, two two-link manipulators, an electrical power system, digital and analog I/O capabilities, high speed vision, and a multiprocessor real-time computer. These subsystems have been carefully integrated in a modular architecture that facilitates maintenance and ease of use. A sophisticated

control system was designed and implemented to manage and coordinate the actions of the vehicle/manipulator system. A custom on-board vision system is used for closed-loop endpoint control and object tracking in the robot's local reference frame. A multicamera off-board vision system provides global positioning information to the robot via a wireless communication link. Successful rendezvous, tracking, and capture of free-flying, spinning objects is facilitated by simultaneously controlling the robot base position and manipulator motions. These actions are coordinated by a sophisticated event-driven finite-state machine. A graphical user interface enables a remotely situated operator to provide high-level task description commands to the robot and to monitor the robot's activities while it carries out these assignments. The user interface allows a task to be fully specified before any action takes place, thereby eliminating problems associated with communications delays. The success of this project was predicated on viewing it first and foremost as a systems engineering problem. A design philosophy that emphasized maintaining a system perspective while utilizing a modular implementation served to guide virtually every phase of its development. This approach to systems engineering is expounded upon in the early chapters of the thesis and contributes to the general applicability of the concepts and ideas presented in the later ones. Dissert. Abstr.

N94-33559* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

COSMIC BACKGROUND RADIATION EXPLORER (COBE) (Videotape)

Oct. 1989 Videotape: 12 min. 56 sec. playing time, in color, with sound (NASA-TM-109801; NONP-VT-94-12929) Avail: CASI VHS A01/BETA A22

This video explains the mission of the Cosmic Background Radiation Explorer (COBE) prior to its November 1989 launch. It also includes animated footage on the Big Bang theory. CASI

N94-33561* National Aeronautics and Space Administration, Washington, DC.

UNITED STATES/RUSSIA SPACE COOPERATION DOCUMENTARY (Videotape)

Dec. 1993 Videotape: 24 min. 15 sec. playing time, in color, with sound (NASA-TM-109809; NONP-VT-94-12937) Avail: CASI VHS A01/BETA A22

This video documents the initiative to develop a multinational, permanent space research laboratory. Historical background on the U.S. and Soviet manned space flight program as well as joint efforts such as the Apollo-Soyuz link up is shown. The current initiative will begin with collaborative missions involving NASA's space shuttle and Russia's Mir space station, and culminate in a permanently manned space station involving the U.S., Russia, Japan, Canada, and ESA. Shown are computer simulations of the proposed space station. Commentary is provided by the NASA administrator, former astronauts, cosmonauts, and Russian and American space experts. CASI

N94-33580* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

DYNAMIC ANALYSIS FOR SPACE STATION FREEDOM (Videotape)

1991 Videotape: 13 min. 30 sec. playing time, in color, with sound (NASA-TM-109826; NONP-VT-94-12954) Avail: CASI VHS A01/BETA A22

This video utilizes computer animations to identify the structure, functions, and design of the Space Station Freedom. CASI

N94-34063*# Eloret Corp., Palo Alto, CA.

HIGH-TEMPERATURE BEHAVIOR OF ADVANCED SPACECRAFT TPS Final Technical Report, 1 Feb. 1987 - 31 Jan. 1994

Joan Pallix 10 May 1994 13 p

(Contract NCC2-462)

(NASA-CR-195832; NAS 1.26:195832) Avail: CASI HC A03/MF A01

The objective of this work has been to develop more efficient, lighter weight, and higher temperature thermal protection systems (TPS) for future reentry space vehicles. The research carried out during this funding period involved the design, analysis, testing, fabrication, and characterization of thermal protection materials to be used on future hypersonic vehicles. This work is important for the prediction of material performance at high temperature and aids in the design of thermal protection systems for a number of programs including programs such as the National Aerospace Plane (NASP), Pegasus and Pegasus/SWERVE, the Comet Rendezvous and Flyby Vehicle (CRAF), and the Mars mission entry vehicles. Research has been performed in two main areas including development and testing of thermal protection systems (TPS) and computational research. A variety of TPS materials and coatings have been developed during this funding period. Ceramic coatings were developed for flexible insulations as well as for low density ceramic insulators. Chemical vapor deposition processes were established for the fabrication of ceramic matrix composites. Experimental testing and characterization of these materials has been carried out in the NASA Ames Research Center Thermophysics Facilities and in the Ames time-of-flight mass spectrometer facility. By means of computation, we have been better able to understand the flow structure and properties of the TPS components and to estimate the aerothermal heating, stress, ablation rate, thermal response, and shape change on the surfaces of TPS. In addition, work for the computational surface thermochemistry project has included modification of existing computer codes and creating new codes to model material response and shape change on atmospheric entry vehicles in a variety of environments (e.g., earth and Mars atmospheres). Author (revised)

N94-34074*# Logicon Control Dynamics Co., Huntsville, AL.

DEFINITION OF GROUND TEST FOR VERIFICATION OF LARGE SPACE STRUCTURE CONTROL Final Report, 20 Jun. 1984 - 31 Jan. 1994

John R. Glaese 31 Jan. 1994 47 p

(Contract NAS8-35835)

(NASA-CR-193945; NAS 1.26:193945) Avail: CASI HC A03/MF A01

Under this contract, the Large Space Structure Ground Test Verification (LSSGTV) Facility at the George C. Marshall Space Flight Center (MSFC) was developed. Planning in coordination with NASA was finalized and implemented. The contract was modified and extended with several increments of funding to procure additional hardware and to continue support for the LSSGTV facility. Additional tasks were defined for the performance of studies in the dynamics, control and simulation of tethered satellites. When the LSSGTV facility development task was completed, support and enhancement activities were funded through a new competitive contract won by LCD. All work related to LSSGTV performed under NAS8-35835 has been completed and documented. No further discussion of these activities will appear in this report. This report summarizes the tether dynamics and control studies performed. Derived from text

N94-34103*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ROBUST CONTROL OF NONLINEAR FLEXIBLE MULTIBODY SYSTEMS USING QUATERNION FEEDBACK AND DISSIPATIVE COMPENSATION

Atul G. Kelkar (Old Dominion Univ., Norfolk, VA.) and Suresh M. Joshi Apr. 1994 19 p

(RTOP 233-01-01-05)

(NASA-TM-109099; NAS 1.15:109099) Avail: CASI HC A03/MF A01

Global asymptotic stability of a class of nonlinear multibody flexible space structures under dissipative compensation is established. Two cases are considered. The first case allows unlimited nonlinear motions of the entire system and uses quaternion feedback. The second case assumes that the central body motion is in the linear range although the other bodies can undergo unrestricted nonlinear motion. The stability is proved to be robust to the inherent modeling nonlinearities and uncertainties. Furthermore, for the second case, the stability is also shown to be robust to certain actuator and sensor nonlinearities. The stability proofs use the Lyapunov approach and exploit the inherent passivity of such systems. The results are applicable to a wide class of systems, including flexible space structures with articulated flexible appendages. Author

N94-34147*# Science Applications International Corp., Huntsville, AL.

LDEF SATELLITE RADIATION STUDY Final Report, 17 Jun. 1990 - 30 Sep. 1993

T. W. Armstrong and B. L. Colborn Mar. 1994 83 p

(Contract NAS8-38566)

(NASA-CR-193948; NAS 1.26:193948; SAIC-94/8002) Avail: CASI HC A05/MF A01

Some early results are summarized from a program under way to utilize LDEF satellite data for evaluating and improving current models of the space radiation environment in low earth orbit. Reported here are predictions and comparisons with some of the LDEF dose and induced radioactivity

data, which are used to check the accuracy of current models describing the magnitude and directionality of the trapped proton environment. Preliminary findings are that the environment models underestimate both dose and activation from trapped protons by a factor of about two, and the observed anisotropy is higher than predicted. Author

N94-34292# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

RESONANCE CAPTURE IN UNBALANCED DUAL-SPIN SPACECRAFT M.S. Thesis

Raymond Tsui Mar. 1994 154 p

(AD-A278501; AFIT/GA/ENY/94M-3) Avail: CASI HC A08/MF A02

This study examines the spinup dynamics of dual-spin spacecraft having an imbalanced rotor. Of particular interest is a phenomenon called 'resonance capture' during which the spinup motor torque induces uncontrolled growth of nutation. A captured spacecraft tumbles end-over-end, while an escaped spacecraft experiences little nutation growth. The conditions which lead to both state are analyzed. A set of criteria based on the spacecraft's kinetic energy at the time of spinup is used to determine whether or not it has been captured. To calculate the final energies against which these criteria are compared, a set of nondimensional equations of motion are numerically integrated. Using computer simulations, magnitude of the motor torque is shown to affect the probability of capture. For prolate spinup, larger torques are desirable, whereas for oblate spinup, smaller torques are preferred. This probability is also influenced by the initial spin configuration and is determine here as a function of the initial energies. For a given motor torque, some initial energies lead to guaranteed capture and others to guaranteed escape. This information is combined to form a 'map' which allows designers to find the best initial spinup conditions for a given spacecraft. DTIC

N94-34386*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

REAL-TIME RMS ACTIVE DAMPING AUGMENTATION: HEAVY AND VERY LIGHT PAYLOAD EVALUATIONS

Martha E. Demeo (Vigyan Research Associates, Inc., Hampton, VA.), Michael G. Gilbert, Janet A. Lepanto, Karl W. Flueckiger, Elizabeth M. Bains, and Mary C. Jensen Jun. 1994 13 p Proposed for presentation at the AIAA Guidance, Navigation, and Control Conference, Scottsdale, AZ, 1-3 Aug. 1994

(RTOP 233-01-01-01)

(NASA-TM-109134; NAS 1.15:109134) Avail: CASI HC A03/MF A01

Controls-Structures Integration Technology has been applied to the Space Shuttle Remote Manipulator System (RMS) to improve on-orbit performance. The objective was to actively damp undesired oscillatory motions of the RMS following routine payload maneuvering and Shuttle attitude control thruster firings. Simulation of active damping was conducted in the real-time, man-in-the-loop Systems Engineering Simulator at NASA's Johnson Space Center. The simulator was used to obtain qualitative and quantitative data on active damping performance from astronaut operators. Using a simulated three-axis accelerometer mounted on the RMS, 'sensed' vibration motions were used to generate joint motor commands that reduced the unwanted oscillations. Active damping of the RMS with heavy and light attached payloads was demonstrated in this study. Five astronaut operators examined the performance of active damping following operator commanded RMS maneuvers and Shuttle thruster firings. Noticeable improvements in the damping response of the RMS with the heavy, Hubble Space Telescope payload and the very light, astronaut in Manipulator Foot Restraint payload were observed. The potential of active damping to aid in precisely maneuvering payloads was deemed significant. Author

N94-34411*# National Academy of Sciences - National Research Council, Washington, DC. Panel on Small Spacecraft Technology.

TECHNOLOGY FOR SMALL SPACECRAFT Final Report

National Academy Press 1994 152 p Original contains color illustrations

(Contract NASw-4003)

(NASA-CR-196041; NAS 1.26:196041; LC-94-67334; ISBN-0-309-05075-8)

Avail: CASI HC A08/MF A02; 2 functional color pages

This report gives the results of a study by the National Research Council's Panel on Small Spacecraft Technology that reviewed NASA's technology development program for small spacecraft and assessed technology within the U.S. government and industry that is applicable to small spacecraft. The panel found that there is a considerable body of advanced technology currently available for application by NASA and the small spacecraft industry that could provide substantial improvement in capability and cost over those technologies used for current NASA small spacecraft. These technologies are the result of developments by commercial companies, Department of Defense agencies, and to a lesser degree NASA. The panel also found that additional technologies are being developed by these same entities that could provide additional substantial improvement if development is successfully completed. Recommendations for future technology development efforts by NASA across a broad technological spectrum are made. Derived from text

N94-34729*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THE SAMPIE FLIGHT EXPERIMENTAL FINAL TECHNICAL REQUIREMENTS DOCUMENT

G. Barry Hillard and Dale C. Ferguson Jun. 1993 28 p

(RTOP 506-48-2B)

(NASA-TM-106224; E-7942; NAS 1.15:106224) Avail: CASI HC A03/MF A01

The Solar Array Module Plasma Interactions Experiment (SAMPIE) is a shuttle based flight experiment scheduled for launch in early 1994. SAMPIE will investigate plasma interactions of high voltage space power systems in low earth orbit. Solar cell modules, representing several technologies, will be biased through a series of high voltages to characterize both arcing and plasma current collection. Other solar modules, specially modified in accordance with current theories of arcing and breakdown, will demonstrate the possibility of arc suppression. Finally, several test modules will be included to study the basic nature of these interactions. The science and technology goals for the project are defined in the Technical Requirements Document (TRD) which is presented here in its final form. The experiment is being developed at NASA LeRC in Cleveland, Ohio, and is sponsored by the NASA Office of Aeronautics and Space Technology (OAST). Author (revised)

N94-33667*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DIAGNOSING ANOMALIES OF SPACECRAFT FOR SPACE MAINTENANCE AND SERVICING

Michael Lauriente, Mark Rolincik, Harry C. Koons, and David Gorney *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 641-651 (For primary document see N94-33612 10-99)

Avail: CASI HC A03/MF A03

N94-33669*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SPACEHAB 1 MAINTENANCE EXPERIMENT

Jackie W. Bohannon *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 661-665 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

N94-34027*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ROBOLAB AND VIRTUAL ENVIRONMENTS

Joseph C. Giarratano *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 61-68 (For primary document see N94-34019 10-99)

Avail: CASI HC A02/MF A04

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxilliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

N94-33557* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
ASRM TESTING AT STENNIS SPACE CENTER (PROPOSED) (Videotape)
1993 Videotape: 6 min. playing time, in color, with sound
(NASA-TM-109795; NONP-VT-94-12923) Avail: CASI VHS A01/BETA A22

This summary of the Advanced Solid Rocket Motor (ASRM) program at Stennis Space Center has a specific focus on the environmental impact. CASI

N94-33582* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ONE FANTASTIC RIDE (Videotape)
1991 Videotape: 14 min. 15 sec. playing time, in color, with sound
(NASA-TM-109828; NONP-VT-94-12956) Avail: CASI VHS A01/BETA A22

This video gives an overview of work being done by the Space Propulsion Technology Division at LeRC. This division conducts research on chemical, nuclear-thermal, and solar propulsion systems and propellants. Two ongoing projects highlighted are a low-thrust rocket for moving around in Earth orbit and large unmanned cargo rockets, both for use with the Space Station. CASI

N94-33606*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
OPERATING CHARACTERISTICS OF THE RUSSIAN D-55 THRUSTER WITH ANODE LAYER
John M. Sankovic, Thomas W. Haag, and David H. Manzella Jun. 1994 23 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-30 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE
(Contract NAS3-27186; RTOP 506-42-31)
(NASA-TM-106610; E-8694; NAS 1.15:106610; AIAA Paper 94-3011)
Copyright Avail: CASI HC A03/MF A01

Performance measurements of a Russian engineering-model Thruster with Anode Layer (TAL) were obtained as part of a program to evaluate the operating characteristics of Russian Hall-thruster technology. The TAL model D-55 was designed to operate in the 1-2 kW power range on xenon. When received, the thruster had undergone only a few hours of acceptance testing by the manufacturer. Direct thrust measurements were obtained at a background pressure of 0.0003 Pa (2 x 10(exp -6) torr) at power levels ranging from 0.3 kW to 2.1 kW. At the nominal power level of 1.3 kW, a specific impulse level of 1600 s with a corresponding efficiency of 0.48 was attained. At all flow rates tested, the efficiency increased linearly with specific impulse until a maximum was reached, and then the efficiency leveled off. Increasing the anode flow rate shifted the efficiency upward, reaching 0.50 at 1850 s specific impulse. The thruster was equipped with inner and outer electromagnets which were isolated from the discharge and from each other. Variation of the magnetic field, obtained by changing the currents through the magnets, had little effect on performance, except at current levels below 70 percent of nominal. For a given operating condition, the performance was slightly affected by facility pressure. As the pressure was increased by a factor of thirty to 0.008 Pa (6 x 10(exp -5) torr), the current steadily increased by 4 percent, and the thrust increased by 2 percent. Performance comparisons were made with the Stationary Plasma Thruster, and the efficiency and specific impulse values were similar at power levels ranging from 0.9 kW to 1.5 kW. Endurance testing was not performed, and comparisons of lifetime were not made. Author

N94-33953*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
FUZZY LOGIC APPROACHES TO MULTI-OBJECTIVE DECISION-MAKING IN AEROSPACE APPLICATIONS
Terry L. Hardy Jun. 1994 18 p Presented at the 30th Joint Propulsion Conference, Colorado Springs, CO, 20-23 Jun. 1994; sponsored by AIAA
(RTOP 232-02-0A)
(NASA-TM-106599; E-8873; NAS 1.15:106599; AIAA Paper 94-3163)
Avail: CASI HC A03/MF A01

Fuzzy logic allows for the quantitative representation of multi-objective decision-making problems which have vague or fuzzy objectives and parameters. As such, fuzzy logic approaches are well-suited to situations where alternatives must be assessed by using criteria that are subjective and of unequal importance. This paper presents an overview of fuzzy logic and provides sample applications from the aerospace industry. Applications include an evaluation of vendor proposals, an analysis of future space vehicle options, and the selection of a future space propulsion system. On the basis of the results provided in this study, fuzzy logic provides a unique perspective on the decision-making process, allowing the evaluator to assess the degree to which each option meets the evaluation criteria. Future decision-making should take full advantage of fuzzy logic methods to complement existing approaches in the selection of alternatives. Author

N94-33975*# NYMA, Inc., Brook Park, OH. Engineering Services Div.
MULTIPLE HOLLOW CATHODE WEAR TESTING Final Report
George C. Soulas Jun. 1994 6 p Presented at the Tri-Service/NASA Cathode Workshop, Cleveland, OH, 29-31 Mar. 1994
(Contract NAS3-25266; RTOP 478-43-10)
(NASA-CR-195335; E-8876; NAS 1.26:195335) Avail: CASI HC A02/MF A01

A hollow cathode-based plasma contactor has been baselined for use on the Space Station to reduce station charging. The plasma contactor provides a low impedance connection to space plasma via a plasma produced by an arc discharge. The hollow cathode of the plasma contactor is a refractory metal tube, through which xenon gas flows, which has a disk-shaped plate with a centered orifice at the downstream end of the tube. Within the cathode, arc attachment occurs primarily on a Type S low work function insert that is next to the orifice plate. This low work function insert is used to reduce cathode operating temperatures and energy requirements and, therefore, achieve increased efficiency and longevity. The operating characteristics and lifetime capabilities of this hollow cathode, however, are greatly reduced by oxygen bearing contaminants in the xenon gas. Furthermore, an optimized activation process, where the cathode is heated prior to ignition by an external heater to drive contaminants such as oxygen and moisture from the insert absorbed during exposure to ambient air, is necessary both for cathode longevity and a simplified power processor. In order to achieve the two year (approximately 17,500 hours) continuous operating lifetime requirement for the plasma contactor, a test program was initiated at NASA Lewis Research Center to demonstrate the extended lifetime capabilities of the hollow cathode. To date, xenon hollow cathodes have demonstrated extended lifetimes with one test having operated in excess of 8000 hours in an ongoing test utilizing contamination control protocols developed by Sarver-Verhey. The objectives of this study were to verify the transportability of the contamination control protocols developed by Sarver-Verhey and to evaluate cathode contamination control procedures, activation processes, and cathode-to-cathode dispersions in operating characteristics with time. These were accomplished by conducting a 2000 hour wear test of four hollow cathodes with different xenon gas purities and activation processes. The following will be presented: a description of the facility and test hardware, testing procedures and operating conditions, a discussion of test results, and conclusions. Author

N94-34079 Electric Material Consultancy, Malvern (England).
THE 3RD INTERNATIONAL SYMPOSIUM ON SPECIAL TOPICS IN CHEMICAL PROPULSION: NON-INTRUSIVE COMBUSTION DIAGNOSTICS
14 May 1993 237 p Symposium held in Scheveningen, Netherlands, 10-14 May 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAJA45-92-M-0334)
(AD-A277443; R/D-6971-EE-02) Avail: CASI HC A11

The topics covered include the following: Quantitative Absorption and Fluorescence Diagnostics in Combustion Systems, LIF and PLIF Diagnostics; Species Concentration and Temperature Measurements by Single-Pulse Spontaneous Raman Scattering in a Turbulent H2/air Flame; Quantitative Two-Dimensional Single Pulse Measurements of Temperature and Species

Concentrations Using LIF; Laser Induced Fluorescence Thermometry of Burning and Evaporating Fuel Droplets; Particle Diagnostics for Combustion Systems; Phase Doppler Particle Sizing Inside a Production Gas Turbine Combustor; Characterization and Diagnostics of Single Particles Oxidized in an Electro-dynamic Chamber; Ignition and Combustion of Mg-Coated and Uncoated Boron Particles; Rocket Exhaust Particles Sizing and Combustion Diagnostics of Metallic Species from Solid Propellants; and Computerized Video Image Processing Technique for Droplet Combustion Studies. DTIC

N94-34137# Sandia National Labs., Albuquerque, NM.
UTILIZING A RUSSIAN SPACE NUCLEAR REACTOR FOR A US SPACE MISSION: SYSTEMS INTEGRATION ISSUES
E. Reynolds (Johns Hopkins Univ., Laurel, MD.), E. Schaefer (Johns Hopkins Univ., Laurel, MD.), G. Polansky (Phillips Lab., Edwards AFB, CA.), J. Lacy (Phillips Lab., Edwards AFB, CA.), and A. Bocharov (Central Design Bureau for Machine Building, Saint Petersburg, Russia.) 30 Sep. 1993 10 p Presented at the 11th Symposium on Space Nuclear Power Systems, Albuquerque, NM, 9-13 Jan. 1994
(Contract DE-AC04-94AL-85000)
(DE94-005585; SAND-93-2345C; CONF-940101-33) Avail: CASI HC A02/MF A01

The Nuclear Electric Propulsion Space Test Program (NEPSTP) has developed a cooperative relationship with several institutes of the former Soviet Union to evaluate Russian space hardware on a US spacecraft. One component is the Topaz 2 Nuclear Power System; a built and flight qualified nuclear reactor that has yet to be tested in space. The access to the Topaz 2 reactor provides the NEPSTP with a rare opportunity; to conduct an early flight demonstration of nuclear electric propulsion at a relatively low cost. This opportunity, however, is not without challenges. Topaz 2 was designed to be compatible with Russian spacecraft and launch vehicles. It was manufactured and flight qualified by Russian techniques and standards and conforms to safety requirements of the former Soviet Union, not the United States. As it is desired to make minimal modifications to the Topaz 2, integrating the reactor system with a United States spacecraft and launch vehicle presents an engineering challenge. This paper documents the lessons learned regarding the integration of reactor based spacecraft and also some insight about integrating Russian hardware. It examines the planned integration flow along with specific reactor requirements that affect the spacecraft integration including American-Russian space system compatibility. DOE

N94-34211*# Oak Ridge National Lab., TN. Engineering Physics and Mathematics Div.
SCOPING CALCULATIONS OF POWER SOURCES FOR NUCLEAR ELECTRIC PROPULSION
F. C. Difilippo May 1994 168 p Sponsored in cooperation with DOE
(Contract DE-AC05-84OR-21400)
(NASA-CR-191133; NAS 1.26:191133; ORNL/TM-12703) Avail: CASI HC A08/MF A02

This technical memorandum describes models and calculational procedures to fully characterize the nuclear island of power sources for nuclear electric propulsion. Two computer codes were written: one for the gas-cooled NERVA derivative reactor and the other for liquid metal-cooled fuel pin reactors. These codes are going to be interfaced by NASA with the balance of plant in order to make scoping calculations for mission analysis. Author

N94-34235*# Rockwell International Corp., Fairview Park, OH. Rocketdyne Div.
ELECTRICAL CHARACTERIZATION OF A SPACE STATION FREEDOM ALPHA UTILITY TRANSFER ASSEMBLY Final Report
Edward J. Yenni Feb. 1994 7 p Presented at the 27th Intersociety Energy Conversion Engineering Conference, San Diego, CA, 3-6 Aug. 1992; sponsored by the SAE, ACS, AIAA, ASME, IEEE, AIChE, and ANS
(Contract NAS3-25711; RTOP 474-42-10)
(NASA-CR-191108; E-7715; NAS 1.26:191108) Avail: CASI HC A02/MF A01

Electrical power, command signals and data are transferred across the Space Station Freedom solar alpha rotary joint by roll rings, which are incorporated within the Utility Transfer Assembly (UTA) designed and manufactured by Honeywell Space Systems Operations. A developmental Model of the UTA was tested at the NASA Lewis Research Center using the Power Management and Distribution DC test bed. The objectives of these tests were to obtain data for calibrating system models and to support final design of qualification and flight units. This testing marked the first time the UTA was operated at high power levels and exposed to electrical conditions similar to that which it will encounter on the actual Space Station. Satisfactory UTA system performance was demonstrated within the scope of this testing. Author

N94-34392*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STRUCTURALLY COMPLIANT ROCKET ENGINE COMBUSTION CHAMBER: EXPERIMENTAL AND ANALYTICAL VALIDATION
Robert S. Jankovsky, Vinod K. Arya, John M. Kazaroff, and Gary R. Halford Washington Mar. 1994 12 p Presented at the 1993 JANNAF Propulsion Meeting, Monterey, CA, 15-18 Nov. 1993 Original contains color illustrations
(RTOP 584-04-11)
(NASA-TP-3431; E-8261; NAS 1.60:3431) Avail: CASI HC A03/MF A01; 1 functional color page

A new, structurally compliant rocket engine combustion chamber design has been validated through analysis and experiment. Subscale, tubular channel chambers have been cyclically tested and analytically evaluated. Cyclic lives were determined to have a potential for 1000 percent increase over those of rectangular channel designs, the current state of the art. Greater structural compliance in the circumferential direction gave rise to lower thermal strains during hot firing, resulting in lower thermal strain ratcheting and longer predicted fatigue lives. Thermal, structural, and durability analyses of the combustion chamber design, involving cyclic temperatures, strains, and low-cycle fatigue lives, have corroborated the experimental observations. Author

N94-34924*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE PREDICTION OF NOZZLE PERFORMANCE AND HEAT TRANSFER IN HYDROGEN/OXYGEN ROCKET ENGINES WITH TRANSPIRATION COOLING, FILM COOLING, AND HIGH AREA RATIOS
Kenneth J. Kacynski and Joe D. Hoffman May 1994 13 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-29 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE
(RTOP 232-01-0A)
(NASA-TM-106617; E-8902; NAS 1.15:106617; AIAA Paper 94-2757)
Avail: CASI HC A03/MF A01

An advanced engineering computational model has been developed to aid in the analysis of chemical rocket engines. The complete multispecies, chemically reacting and diffusing Navier-Stokes equations are modelled, including the Soret thermal diffusion and Dufour energy transfer terms. Demonstration cases are presented for a 1030:1 area ratio nozzle, a 25 lbf film-cooled nozzle, and a transpiration-cooled plug-and-spool rocket engine. The results indicate that the thrust coefficient predictions of the 1030:1 nozzle and the film-cooled nozzle are within 0.2 to 0.5 percent, respectively, of experimental measurements. Further, the model's predictions agree very well with the heat transfer measurements made in all of the nozzle test cases. It is demonstrated that thermal diffusion has a significant effect on the predicted mass fraction of hydrogen along the wall of the nozzle and was shown to represent a significant fraction of the diffusion fluxes occurring in the transpiration-cooled rocket engine. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

N94-33932# Emory Univ., Atlanta, GA. Dept. of Chemistry.
KINETICS AND MECHANISMS OF REACTIONS INVOLVING SMALL AROMATIC REACTIVE INTERMEDIATES
M. C. Lin 1994 9 p
(Contract DE-FG05-91ER-14191)
(DE94-009475; DOE/ER-14191/T1) Avail: CASI HC A02/MF A01

Phenyl (C6H5), phenoxy (C6H5O), and benzyne (C6H4) are fundamentally important prototype molecules. C6H5 and C6H5O are also very important reactive intermediates in hydrocarbon combustion systems,

particularly with regard to soot formation chemistry, as well as to the combustion chemistry of aromatic additives in gasoline. The authors proposed to study the kinetics and mechanisms of these three benchmark reactive intermediates using two complementary laser diagnostic techniques -- laser resonance absorption (LRA) and resonance enhanced multiphoton ionization mass spectrometry (REMPI/MS). In the first year of this contractual work, they have employed a new type of LRA, i.e. the intracavity resonance absorption technique, to measure the rate constants for C6H5 reactions, extending the limit of rate constant measurement down to 10(exp -18) cm(exp 3)/s. They have tested this method for the following reactions: C6H5 + HBr, CH2O, O2, C2H2, and C2H4 at 297 K and obtained their rate constants to be 3.0 x 10(exp -11), 1.2 x 10(exp -14), 1.0 x 10(exp -16), 7.0 x 10(exp -18) and 6.7 x 10(exp -18) cm(exp 3)/s, respectively. In the second study, the REMPI spectroscopy of C6H5 is being investigated with the two laser pump-probe surface photolysis method. The desorbed C6H5 photofragment is ionized by (1+1) MPI in the spectral range 200 to 260 nm. Similarly, the NO photofragment is also detected by (1+1) MPI in the same spectral region. The detailed photofragmentation of the absorbed C6H5NO at 193 and 248 nm is being analyzed presently and a new experiment with acetophenone on a quartz surface is under way. DOE

N94-33962 California Univ., Los Angeles, CA. Dept. of Materials Science and Engineering.
ULTRASTRUCTURE PROCESSING OF ADVANCED MATERIALS Final Technical Report, 1 Dec. 1990 - 30 Nov. 1993
John D. Mackenzie Jan. 1994 27 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0096-91)
(AD-A278285; AFOSR-94-0197TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This Final Technical Report covering the three-year period from December 1, 1990 to November 30, 1993 presents a summary of research performed on two classes of materials obtained by the sol-gel method. Single crystal thin films were successfully prepared for the ferroelectric materials KNbO3 and LiNbO3. A new phenomenon, Amorphous Ferroelectricity, was discovered. Organically Modified Silicates (Ormosils) were further developed to give enhanced high temperature rubbery elasticity. A theory was developed for the calculation of the hardness of Ormosils. By modifying the Ormosils with Ti, Zr, and Al to replace Si, Vickers Hardness of over 200 Kg/sq mm was obtained. This is about ten times that of the hardness of the hardest transparent organic plastics. DTIC

24 COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

For ceramic materials see *27 Nonmetallic Materials*.

N94-33362 Stanford Univ., CA.
INDUCTION HEATING MODEL FOR HIGH-FREQUENCY INDUCTION JOINING AND REPAIR OF COMPLEX-SHAPE GRAPHITE FIBER/POLYMER MATRIX COMPOSITES Ph.D. Thesis
Wendy Wen-Ling Lin 1993 244 p
Avail: Univ. Microfilms Order No. DA9317789

An induction heating model has been developed to predict heating patterns and behavior in complex-shape graphite fiber/polymer matrix composites under arbitrary induction coil shapes. The heating is assumed to be caused primarily by resistive loses in the fibers due to eddy currents generated by an alternating magnetic field. The model predicts the eddy current patterns in the material as a function of coil and material geometry, allowing the user to predict heating effects due to factors such as edges and anisotropy. Heat generation rates and heat transfer are then calculated to find the full transient temperature distribution throughout the composite. Additional capabilities of this program include the ability to deal with multiple coils and workpieces and moving coils. The model uses finite difference methods in two dimensions for these calculations. Basic electromagnetic and heat transfer laws are used to calculate the magnetic fields, eddy currents, and temperatures. The predicted heating patterns correspond well with experimental data. The ultimate purpose of this model is to enhance the users' understanding and control of the induction heating process under various conditions and thereby make this a more viable method for joining and repair of composite materials. Dissert. Abstr.

N94-33532 Stanford Univ., CA.
SHAPE CONTROL OF COMPOSITE PLATES AND SHELLS USING EMBEDDED ACTUATORS Ph.D. Thesis
David Barrie Koconis 1993 182 p
Avail: Univ. Microfilms Order No. DA9317781

The changes in shapes of fiber-reinforced composite beams, plates and shells affected by embedded piezoelectric actuators were investigated. Two analytical methods were developed. The first can be used to calculate the changes in shapes for specified applied voltages to the actuators. The second to determine the voltages needed to achieve a specified shape. Both methods are formulated on the basis of mathematical models using two-dimensional, linear, shallow shell theory including transverse shear effects which are important in the case of sandwich construction. The solution technique used is the Ritz method. Two computationally efficient, user-friendly computer codes were written which are suitable for performing the numerical calculations. The first code, designated as SHAPE1, provides the change in shape for specified applied voltages. The second, designated as SHAPE2, gives the voltages needed to achieve specified changes in shape. The first code can be used in the design of the actuator system to determine the configuration most suitable for the given application. The second code can provide, during actual service, the voltages needed to achieve the desired shape changes. To validate the methods and the computer codes, results generated by the codes were compared to existing analytical and experimental results and to test data obtained during the course of the present investigation. The predictions provided by the SHAPE1 and SHAPE2 codes were in excellent agreement with the results of the other analyses and data. Dissert. Abstr.

N94-33593 Pennsylvania State Univ., University Park, PA. Applied Research Lab.
LASER PROCESSING OF DISCONTINUOUSLY REINFORCED ALUMINUM COMPOSITES
K. C. Meinert, Jr., R. B. Bhagat, and R. P. Martukanitz Mar. 1994 123 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00039-92-C-0100)
(AD-A277903; PSU/ARL-TR-94-02) Avail: CASI HC A06

Discontinuously reinforced aluminum (DRA) composites have attractive potential as engineering materials due to the combination of good mechanical properties and relatively low cost; however utilization of these composites requires improved machining and joining procedures. In this study, the feasibility of laser cutting and laser beam welding of DRA composites was investigated. It was found that the DRA composites could be cut at rates faster than that of unreinforced aluminum. The SiC and Al2O3 reinforcement materials absorbed more energy than the monolithic aluminum at the CO2 laser beam wavelength of 10.6 micrometers. The improved energy absorption leads to an increase in laser cutting rates and greater weld penetration over unreinforced aluminum, except in the case of silicon carbide whisker reinforced composites. The formation of aluminum carbide and other difficulties lead to a lower cutting rate than of unreinforced aluminum. The focus of the laser beam welding experimentation dealt with eliminating the formation of aluminum carbide by filler metal additions. Appropriate filler metals and their respective carbides were analyzed for thermodynamic stability and compatibility in the weld. A computer program that determines the equilibrium of chemical systems was employed to predict the amount of titanium necessary to prevent the formation of aluminum carbide in the fusion zone of a Al/SiC/20 composite. The analysis determined that a 22 weight percent addition of titanium to the fusion zone was necessary to prevent the formation of aluminum carbide. DTIC

N94-33681 Lawrence Livermore National Lab., CA.
THE EFFECTS OF IN-SITU PROCESSING METHODS ON THE MICROSTRUCTURE AND FRACTURE TOUGHNESS OF V-V3Si COMPOSITES
M. J. Strum, G. A. Henshall, B. P. Bewlay, J. A. Sutliff, and M. R. Jackson 19 Nov. 1993 6 p Presented at the Fall Meeting of the Materials Research Society, Boston, MA, 29 Nov. - 3 Dec. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract W-7405-eng-48)
(DE94-009093; UCRL-JC-115773; CONF-931108-97) Avail: CASI HC A02

This paper describes ductile-phase roughening in V-V3Si in-situ composites produced by conventional arc melting (AM), cold-crucible induction melting (IM), and cold-crucible directional solidification (DS). Notched three-point bending tests were performed to determine the effects of synthesis method on the room temperature fracture toughness of eutectic compositions, which contain nearly equal volume fractions of V3Si and the V(Si) solid solution phase. Fracture toughness values ranged from 10 MPa square root of m for the AM eutectic to over 20 MPa square root of m for the IM and DS eutectic alloys. SEM fractography, surface profiling, and chemical analyses were performed to correlate the toughness values with the microstructures and interstitial concentrations produced by the three synthesis methods. DOE

N94-33693# Los Alamos National Lab., NM.
THE USE OF PULSED NEUTRON DIFFRACTION TO MEASURE STRAIN IN COMPOSITES
M. A. M. Bourke, J. A. Goldstone, N. Shi, G. T. Gray, III, M. R. James, and R. I. Todd 1994 11 p Presented at the 4th International Conference on Residual Stress (ICRS-4), Baltimore, MD, Jun. 1994
(Contract W-7405-eng-36)
(DE94-007536; LA-UR-94-484; CONF-940692-3) Avail: CASI HC A03/MF A01

Neutron diffraction is a technique for measuring strain in crystalline materials. It is nondestructive, phase discriminatory, and more penetrating than x rays. Pulsed neutron sources (in contrast with steady state reactor sources) are particularly appropriate for examining heterogeneous materials or for recording the polycrystalline response of all lattice reflections. Several different aspects of composite behavior can be characterized and examples are given of residual strain measurements, strain relaxation during heating, applied loading, and determination of the strain distribution function. DOE

N94-33750* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NATIONAL AEROSPACE PLANE (Videotape)
Jul. 1990 Videotape: 5 min. 20 sec. playing time, in color, with sound
(NASA-TM-109843; Rept-4002; NONP-VT-94-13533) Avail: CASI VHS A01/BETA A22

This video concentrates on materials being developed and tested at LeRC for possible use in NASP. CASI

N94-33763 Department of the Navy, Washington, DC.
FIREPROOF BARRIER SYSTEM FOR COMPOSITE STRUCTURE Patent
Patrick D. Conroy, inventor (to Navy) and Usman A. Sorathia, inventor (to Navy) 14 Dec. 1993 4 p Filed 21 Sep. 1992
(AD-D016158; US-Patent-5,270,105; US-Patent-Appl-SN-947592; US-Patent-Class-428-278) Avail: US Patent and Trademark Office

A fireproof barrier system for a composite structure is provided. A sheet of ablative material is bonded onto the composite structure to be fireproofed. A protective phenolic resin skin is deposited on the sheet to protect the ablative material from handling and water damage while further improving the fire performance of the system. The protective skin may have between about 50 to 80 parts per hundred of aluminum trihydrate mixed therein. The protective phenolic resin skin may further be glass-reinforced. DTIC

N94-33899*# Ohio Aerospace Inst., Brook Park.
COUPLED ELECTROMECHANICAL RESPONSE OF COMPOSITE BEAMS WITH EMBEDDED PIEZOELECTRIC SENSORS AND ACTUATORS Final Report
D. A. Saravanos and P. R. Heyliger Jun. 1994 20 p Presented at the ASME Winter Annual Meeting, New Orleans, LA, 28 Nov. - 3 Dec. 1993; sponsored by ASME
(Contract NCC3-208; RTOP 505-63-5B)
(NASA-CR-195313; E-8728; NAS 1.26:195313) Avail: CASI HC A03/MF A01

Unified mechanics are developed with the capability to model both sensory and active composite laminates with embedded piezoelectric layers. A discrete-layer formulation enables analysis of both global and local electromechanical response. The mechanics include the contributions from elastic, piezoelectric, and dielectric components. The incorporation of electric potential into the state variables permits representation of general electromechanical boundary conditions. Approximate finite element solutions for the static and free-vibration analysis of beams are presented. Applications on composite beams demonstrate the capability to represent either sensory or active structures and to model the complicated stress-strain fields, the interactions between passive/active layers, interfacial phenomena between sensors and composite plies, and critical damage modes in the material. The capability to predict the dynamic characteristics under various electrical boundary conditions is also demonstrated. Author

N94-34160 California Univ., Santa Barbara, CA. Dept. of Chemistry.
GENERALIZED SYNTHESES OF PERIODIC SURFACTANT AND INORGANIC COMPOSITE MATERIALS Technical Report, 1 Jun. 1993 - 31 May 1994
Q. Huo, D. I. Margolese, P. Feng, T. E. Gier, and P. Sieger 25 Feb. 1994 22 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-90-J-1159)
(AD-A278001) Avail: CASI HC A03

Here we demonstrate a generalized approach to describe the synthesis of transition and other metal oxide mesophases with cationic and anionic surfactants under variable conditions of pH. We show that tailoring the metal-ion speciation and charge density results in cooperative assembly by electrostatic complementarity at the inorganic/organic interface. Two general synthetic pathways are described: direct co-condensation with surfactants of opposite charge; and indirect co-condensation of similarly charged species mediated by the intercalation of counter ions at the surfactant/inorganic interface. The latter route has been used to produce, for the first time, organized periodic porous silica structures at room temperature in concentrated acid solution. DTIC

N94-34220# Naval Postgraduate School, Monterey, CA. Dept. of Mechanical Engineering.
THE EFFECT OF THERMOMECHANICAL PROCESSING ON MECHANICAL PROPERTIES OF A CAST 6061 ALUMINUM METAL MATRIX COMPOSITE M.S. Thesis
Werner F. Hoyt Dec. 1993 93 p
(AD-A277995) Avail: CASI HC A05/MF A01

Thermomechanical processing was conducted on cast 6061 Al-Al2O3 metal matrix composites (MMC's) containing either 10 or 20 volume percent of alumina (Al2O3) particles. These materials were provided by DURALCAN-USA, Inc., of San Diego, CA, in conjunction with a cooperative research and development agreement (CRDA) program on ductility enhancement for these MMCs. Processing included isothermal forging and rolling of materials at 500 C, with interpass anneal (IPA) times of 5 or 30 minutes. Isothermal rolling was also accomplished on 1.0 inch thick 6061-T6 Al plate. Processed materials were solution heat treated at temperatures ranging from 480 to 560 C, and were then age hardened at 160 C. Tensile testing was conducted to evaluate strength and ductility. Homogeneity of the particle distribution was improved by processing for both composites and no microstructural damage was apparent. Lower solution heat treatment temperature provided significant ductility enhancement while the longer IPA time at 500 C had a minor beneficial effect. As the percentage of reinforcement increased, aging time to peak strength decreased, peak strength and yield strength increased, and ductility decreased. As the solution heat treatment temperature was decreased ductility was enhanced at a cost of peak strength. DTIC

N94-34237*# Utah Univ., Salt Lake City, UT. Dept. of Materials Science and Engineering.
EFFECTS OF FIBER, MATRIX, AND INTERPHASE ON CARBON FIBER COMPOSITE COMPRESSION STRENGTH Final Report
John A. Nairn, Sheila I. Harper, and Willard D. Bascom May 1994 112 p
(Contract NAS1-18883; RTOP 510-02-11)
(NASA-CR-4601; NAS 1.26:4601) Avail: CASI HC A06/MF A02

The major goal of this project was to obtain basic information on compression failure properties of carbon fiber composites. To do this, we investigated fiber effects, matrix effects, and fiber/matrix interface effects. Using each of nine fiber types, we prepared embedded single-fiber specimens, single-ply specimens, and full laminates. From the single-fiber

specimens, in addition to the standard fragmentation test analysis, we were able to use the low crack density data to provide information about the distribution of fiber flaws. The single-ply specimens provided evidence of a correlation between the size of kink band zones and the quality of the interface. Results of the laminate compression experiments mostly agreed with the results from single-ply experiments, although the ultimate compression strengths of laminates were higher. Generally, these experiments showed a strong effect of interfacial properties. Matrix effects were examined using laminates subjected to precracking under mixed-mode loading conditions. A large effect of precracking conditions on the mode 1 toughness of the laminates was found. In order to control the properties of the fiber/matrix interface, we prepared composites of carbon fiber and polycarbonate and subjected these to annealing. The changes in interfacial properties directly correlated with changes in compression strength.

Author (revised)

N94-34258*# Texas A&M Univ., College Station, TX.

EFFECTS OF ASSUMED TOW ARCHITECTURE ON THE PREDICTED MODULI AND STRESSES IN WOVEN COMPOSITES Final Report

Clinton Dane Chapman Apr. 1994 147 p

(Grant NAG3-1270; RTOP 505-62-10)

(NASA-CR-195310; E-8722; NAS 1.26:195310) Avail: CASI HC A07/MF A02

This study deals with the effect of assumed tow architecture on the elastic material properties and stress distributions of plain weave woven composites. Specifically, the examination of how a cross-section is assumed to sweep-out the tows of the composite is examined in great detail. The two methods studied are extrusion and translation. This effect is also examined to determine how sensitive this assumption is to changes in waviness ratio. 3D finite elements were used to study a T300/Epoxy plain weave composite with symmetrically stacked mats. 1/32nd of the unit cell is shown to be adequate for analysis of this type of configuration with the appropriate set of boundary conditions. At low waviness, results indicate that for prediction of elastic properties, either method is adequate. At high waviness, certain elastic properties become more sensitive to the method used. Stress distributions at high waviness ratio are shown to vary greatly depending on the type of loading applied. At low waviness, both methods produce similar results. Author

N94-34306*# Virginia Polytechnic Inst. and State Univ., Blacksburg, VA. Dept. of Engineering Science and Mechanics.

NON-LINEAR NUMERICAL ANALYSIS OF THE IOSIPESCU SPECIMEN FOR COMPOSITE MATERIALS Final Technical Report

Henjen Ho, John Morton, and Gary L. Farley 1994 11 p Repr. from Composites Science and Technology 50, 1994 p 355-365

(Grants NAG1-1393; NAG1-1053; NSF DMR-91-00024) (ISSN 0266-3538) (NASA-CR-195934; NAS 1.26:195934) Copyright Avail: CASI HC A03/MF A01

A nonlinear elastic finite element analysis is presented of the Iosipescu shear specimen tested in the modified Wyoming fixture for unidirectional graphite/epoxy composites. It is shown that the nonlinear effects due to specimen-to-fixture contact interactions and specimen geometry on the overall shear response are negligible. It is proposed that the tangential shear modulus should be used to characterize the shear resistance of composite materials with highly nonlinear shear response. The correction factors, which are needed to compensate for the nonuniformity of the shear stress or strain distribution in the specimen test section for shear modulus measurement, have to be defined carefully. Strain contours in the nonlinear response ranges are presented and the initiation of failure in the notch regions is investigated. Author

N94-34399*# Analytical Services and Materials, Inc., Hampton, VA.

ANALYSIS OF WOVEN AND BRAIDED FABRIC REINFORCED COMPOSITES

Rajiv A. Naik Jun. 1994 47 p Presented at the ASTM 12th Symposium on Composite Materials: Testing and Design, Montreal, Ontario, 16-17 May 1994

(Contract NAS1-19399; RTOP 510-02-12-09)

(NASA-CR-194930; NAS 1.26:194930) Avail: CASI HC A03/MF A01

A general purpose micromechanics analysis that discretely models the yarn architecture within the textile repeating unit cell, was developed to predict overall, three dimensional, thermal and mechanical properties. This analytical technique was implemented in a user-friendly, personal computer-based, windows compatible code called Textile Composite Analysis for Design (TEXCAD). TEXCAD was used to analyze plain, 5-harness satin, and 8-harness satin weave composites along with 2-D braided and 2x2, 2-D triaxial braided composites. The calculated overall stiffnesses correlated well with available 3-D finite element results and test data for both the woven and the braided composites. Parametric studies were performed to investigate the effects of yarn size on the yarn crimp and the overall thermal and mechanical constants for plain weave composites. The effects of braid angle were investigated for the 2-D braided composites. Finally, the effects of fiber volume fraction on the yarn undulations and the thermal and mechanical properties of 2x2, 2-D triaxial braided composites were also investigated. Author

N94-35075* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

LOW PRESSURE PROCESS FOR CONTINUOUS FIBER REINFORCED POLYAMIC ACID RESIN MATRIX COMPOSITE LAMINATES Patent

Darleen A. Druyun, inventor (to NASA), Tan-Hung Hou, inventor (to NASA), Paul W. Kidder, inventor (to NASA), Rakasi M. Reddy, inventor (to NASA), and Robert M. Baucom, inventor (to NASA) 17 May 1994 8 p Filed 30 Jul. 1992 Supersedes N92-34214 (30 - 24, p 4148)

(NASA-Case-LAR-14954-1; US-Patent-5,312,579;
US-Patent-Appl-SN-924689; US-Patent-Class-264-258;
US-Patent-Class-156-87; US-Patent-Class-156-228;
US-Patent-Class-156-307.1; US-Patent-Class-156-312;
US-Patent-Class-156-331.5; US-Patent-Class-264-331.12) Avail: US Patent and Trademark Office

A low pressure processor was developed for preparing a well-consolidated polyimide composite laminate. Prepreg plies were formed from unidirectional fibers and a polyamic acid resin solution. Molding stops were placed at the sides of a matched metal die mold. The prepreg plies were cut shorter than the length of the mold in the in-plane lateral direction and were stacked between the molding stops to a height which was higher than the molding stops. The plies were then compressed to the height of the stops and heated to allow the volatiles to escape and to start the imidization reaction. After removing the stops from the mold, the heat was increased and 0 - 500 psi was applied to complete the imidization reaction. The heat and pressure were further increased to form a consolidated polyimide composite laminate.

Official Gazette of the U.S. Patent and Trademark Office

N94-35076* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

HEAT TRANSFER DEVICE Patent

Bruce A. Banks, inventor (to NASA) and James R. Gaier, inventor (to NASA) 31 May 1994 6 p Filed 10 Feb. 1993 Supersedes N93-20568 (31 - 7, p 1832) Division of US-Patent-Appl-SN-880951, filed 11 May 1992 which is a continuation-in-part of abandoned US-Patent-Appl-SN-657238, filed 19 Feb. 1991 which is a continuation-in-part of abandoned US-Patent-Appl-SN-501893, filed 30 Mar. 1990

(NASA-Case-LEW-14162-4; US-Patent-5,316,080;
US-Patent-Appl-SN-017402; US-Patent-Appl-SN-880951;
US-Patent-Appl-SN-657238; US-Patent-Appl-SN-501893;
US-Patent-Class-165-185; US-Patent-Class-257-720;
US-Patent-Class-361-704; US-Patent-Class-361-707) Avail: US Patent and Trademark Office

Gas derived graphite fibers generated by the decomposition of an organic gas are joined with a suitable binder. This produces a high thermal conductivity composite material which passively conducts heat from a source, such as a semiconductor, to a heat sink. The fibers may be intercalated. The intercalate can be halogen or halide salt, alkaline metal, or any other species which contributes to the electrical conductivity improvement of the graphite fiber. The fibers are bundled and joined with a suitable binder to form a high thermal conductivity composite material device. The heat transfer device may also be made of intercalated highly oriented pyrolytic graphite and machined, rather than made of fibers.

Official Gazette of the U.S. Patent and Trademark Office

N94-33512*# Pratt and Whitney Aircraft, West Palm Beach, FL.

COMBUSTOR MATERIALS REQUIREMENTS AND STATUS OF CERAMIC MATRIX COMPOSITES

Ralph J. Hecht and Andrew M. Johnson *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1549-1564 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33513*# General Electric Co., Cincinnati, OH. Aircraft Engines.
NOZZLE MATERIAL REQUIREMENTS AND THE STATUS OF INTERMETALLIC MATRIX COMPOSITES
Andrew M. Johnson and Ralph J. Hecht *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1567-1582 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33514*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AIRFRAME MATERIALS FOR HSR
Thomas T. Bales *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1585-1606 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33515*# Boeing Commercial Airplane Co., Seattle, WA.
HSCT AIRFRAME MATERIALS: THE BOEING PERSPECTIVE
Donald L. Grande *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1609-1621 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33516*# Douglas Aircraft Co., Inc., Long Beach, CA.
HSCT MATERIALS AND STRUCTURES: AN MDC PERSPECTIVE
Jay O. Sutton *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1625-1641 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*.

N94-33689# Michigan Univ., Ann Arbor, MI.
GROWTH AND NONLINEARITY
R. Savit 1993 7 p
(Contract DE-FG02-85ER-45189)
(DE94-007366; DOE/ER-45189/7) Avail: CASI HC A02/MF A01

The research centered on the physics of growth. One particular focus was the spiral patterns seen in excitable media, such as the chemical reaction of Belousov and Zhabatinskii, and the aggregation of the slime mold, Dictyostelium Discoideum. Another area of interest is the statistical roughness of the growth front itself. For example, when growing thin films, the roughness of the surface is very important for the ultimate quality of the film. Besides its direct technological relevance, this problem is intimately connected to many fundamental problems in statistical physics. In addition work was done in the related area of statistical properties of flux-flow motion in superconductors. Substantial progress was also made on techniques and applications of the analysis of complex systems. Methods of time series analysis were generalized to the analysis of complex spatio-temporal patterns. In the examples studied most, turbulence and electroencephalograms, the spatio-temporal patterns are very complex and fleeting, and can easily be mistaken for random noise. Nevertheless, substantial progress was made in developing and applying methods to these systems that indicate the presence of nonrandom time-varying spatial patterns. DOE

N94-33701 Pennsylvania State Univ., University Park, PA.
DEVELOPMENT OF PREDICTIVE REACTION MODELS OF SOOT FORMATION Final Technical Report, 1 Jan. 1991 - 31 Dec. 1993
Michael Frenklach 9 Feb. 1994 30 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0129-91)
(AD-A278366; AFOSR-94-0186TR) Avail: CASI HC A03

The ultimate objective of the present research program is to develop a predictive reaction model for soot formation in hydrocarbon flames. The principal accomplishments in the reported period are: A computer algorithm was developed that calculates optical properties of an ensemble of particles whose size distribution is given in terms of moments of the size distribution function. A computational study of sooting limits in laminar premixed flames was initiated and completed. It was found that the critical equivalence ratios for soot appearance, both the absolute values and temperature dependencies, can be predicted fairly close to the experimental observations. New estimation techniques were developed and applied for calculations of standard-state enthalpies of formation and binary gaseous diffusion coefficients of polycyclic aromatic hydrocarbons (PAH's) and their radicals, thus providing critical information for accurate modeling of soot formation in flames. Theoretical studies of a bench-mark ion-molecule reaction were initiated and completed. The results obtained further support the neutral-species reaction pathway as the predominant route for the formation and growth of PAHs, the precursors to soot in hydrocarbon flames. A computational study of pressure effect on soot formation was performed. A reduced model for PAH and soot formation in turbulent reactive flows was developed. DTIC

N94-33765 Department of the Navy, Washington, DC.
METHOD OF DETERMINING THE CONCENTRATION OF A CHEMICAL OF INTEREST IN A SOLUTION Patent
Scott M. Inman, inventor (to Navy), Stephen H. Lieberman, inventor (to Navy), and Erik J. Stromvall, inventor (to Navy) 7 Dec. 1993 11 p Filed 7 Mar. 1991
(AD-D016165; US-Patent-5,268,304; US-Patent-Appl-SN-666174; US-Patent-Class-436-172) Avail: US Patent and Trademark Office

A method determines the concentration of a chemical of interest in a solution. A permeable membrane is placed in the solution and a ligand is exuded through the membrane to continually renew the ligand at the surface of the membrane which is in contact with the solution. Complexes of the ligand with the chemicals of interest are formed where the ligand renewed membrane is in contact with the solution. Illuminating the ligand renewed membrane with radiation from a distance from the membrane induces a fluorescence by the formed complexes on the ligand renewed membrane by the illuminating radiation. The fluorescence from the illuminated complexes on the ligand renewed membrane are detected from a distance from the membrane to provide a determination of the concentration of the chemical of interest in the solution. DTIC

N94-33901# UOP, Inc., Des Plaines, IL.
DEVELOPMENT OF A CATALYST FOR CONVERSION OF SYNGAS-DERIVED MATERIALS TO ISOBUTYLENE
P. T. Barger 29 Nov. 1993 7 p
(Contract DE-AC22-91PC-90042)
(DE94-009698; DOE/PC-90042/T8) Avail: CASI HC A02/MF A01

The goal is to develop a catalyst and process for converting of syngas to isobutanol and to evaluate the commercial potential of the new process. This report covers preliminary testing of methanol synthesis catalysts alone and in combination with basic metal oxides. Materials tested included Cu/Zn/Al, Zn/Cr oxides, and K/Zr/Zn/Mn oxides. DOE

N94-33918# California Univ., Berkeley. Lawrence Berkeley Lab, CA.
METHANOL ELECTROOXIDATION ON WELL-CHARACTERIZED Pt-Ru ALLOYS
H. A. Gasteiger, P. N. Ross, Jr., and E. J. Cairns Nov. 1993 165 p
(Contract DE-AC03-76SF-00098)
(DE94-009640; LBL-34894) Avail: CASI HC A08/MF A02

Rate-limiting step in electrooxidation of methanol in sulfuric acid electrolyte on sputter-cleaned Pt-Ru electrodes at 25 C was initial adsorption/dehydrogenation of methanol on Pt surface atom ensembles, resulting in an optimum Ru surface composition of 10 at. %; conversely, Ru-rich surfaces poison the methanol oxidation reaction since Ru is inactive for dissociative adsorption of methanol. However, nucleation of oxygen-containing species on bare Ru atoms at low electrode potentials promotes oxidative removal of methanol dehydrogenation fragments, thereby preventing the long-term deactivation of Pt-Ru electrodes. This bifunctional

character of Pt-Ru alloys was verified in measurements of electrocatalytic activity for electrooxidation of CO: nucleation of oxygen-containing species on Ru surface atoms significantly enhanced the oxidation of adsorbed CO, producing a catalytic shift of 0.25 V for an alloy with the optimum Ru surface composition of approximately 50 at. %. The same optimum Ru surface composition was observed in electrooxidation of formic acid, which similarly to CO interacts with both Pt and Ru surface atoms. For the methanol electrooxidation reaction, activity of Ru for dissociative adsorption of methanol is a strong function of temperature. This change in the adsorptive nature of the Ru sites with temperature produced a variation in the optimum surface composition with temperature, from approximately 7 at 25 C to approximately 33 at. % at 60 C. The shift in optimum composition with temperature was attributed to a shift in the rate-determining step from methanol adsorption/dehydrogenation at room temperature to the surface reaction between the dehydrogenated intermediate and surface oxygen at 60 C. DOE

N94-33939# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.

EFFECTS OF CATALYTIC MINERAL MATTER ON CO AND CO2 TEMPERATURE AND BURNING TIME FOR CHAR COMBUSTION Final Report

J. P. Longwell, A. F. Sarofim, and C. H. Lee 1993 37 p

(Contract DE-FG22-89PC-89774)

(DE94-009130; DOE/PC-89774/T10) Avail: CASI HC A03/MF A01

The high temperature oxidation of char is of interest in a number of applications in which coal must be burned in confined spaces including the conversion of oil-fired boilers to coal using coal-water slurries, the development of a new generation of pulverized-coal-fired cyclone burners, the injection of coal into the tuyeres of blast furnaces, the use of coal as a fuel in direct-fired gas turbines and in large-bore low-speed diesels, and entrained flow gasifiers. There is a need to understand the temperature history of char particles in conventional pulverized-coal-fired boilers to better explain the processes governing the formation of pollutants and the transformation of mineral matter. The temperature of char particle burning is the product of a strongly coupled balance between particle physical properties, heat and mass transfer, surface reaction, and CO/CO2 ratio. Particle temperature has major effects not only on the burning rate but also on ash properties and mineral matter vaporization. Measurements of the temperature of individual burning char particles have clearly demonstrated large particle-to-particle temperature variations which depend strongly on particle size and on particle composition. This report consists of two major parts. In the first part, experimental measurements of CO/CO2 ratio for a single spherocarb particle is presented along with a kinetic model which allows estimation of CO/CO2 generated at a carbon surface for temperatures higher than those reported in the experimental work. In the second part, modeling of a temperature profile during a char combustion is reported, and also progress in modeling the complex sets of coupled phenomena involving full gas phase reaction kinetics, heat transfer, and mass transfer is summarized. In the appendix progress on construction and testing of an improved electrodynamic balance is presented. DOE

N94-33959*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

REDETERMINATION OF PIPERIDINIUM HYDROGEN SULFIDE STRUCTURE

Maria T. Andras, Aloysius F. Hepp, Phillip E. Fanwick, Stan A. Duraj, and Edward M. Gordon Apr. 1994 13 p

(Contracts NCC3-246; NCC3-162; NCC3-281; RTOP 233-01-0R)

(NASA-TM-106527; E-8653; NAS 1.15:106527) Avail: CASI HC A03/MF A01

The presence of adventitious water in a reaction between dicyclopentamethylene thiuram-disulfide (C5H10NCS2)(sub 2) and a picoline solution of tricyclopentadienyl indium(III) (C5H5)(sub 3). It resulted in the formation of piperidinium hydrogen sulfide (C5H13NS). The piperidinium hydrogen sulfide produced in this way was unambiguously characterized by X-ray crystallography. The structure determination showed that the piperidinium hydrogen sulfide crystal (MW = 119.23 g/mol) has an orthorhombic (Pbcm) unit cell whose parameters are: a = 9.818(2), b = 7.3720(1), c = 9.754(1) A, V = 706.0(3) A(exp 3), Z=4. D(sub chi) = 1.122 g cm(exp -3), Mo K(alpha) (lamda = 0.71073), mu= 3.36 cm(exp -1), F(000) = 264.0, T =293 K, R = 0.036 for 343 reflections with F(sub O)(sup 2) greater than 3 sigma (F(sub O)(sup 2)) and 65 variables. The compound consists of (C5H10NH2)(+) cations and (SH)(-) anions with both species residing on crystallographic mirror planes. N-H -- S hydrogen bonding contributes to the interconnection of neighboring piperidinium components of the compound. Author

N94-34098# Los Alamos National Lab., NM.

THE MICROSTRUCTURE AND MORPHOLOGY OF CARBON BLACK: A STUDY USING SMALL ANGLE NEUTRON SCATTERING AND CONTRAST VARIATION

R. P. Hjelm, Jr., P. A. Seeger, W. A. Wampler, and M. Gerspacher 1994 34 p Presented at the American Chemical Society Conference, Chicago, IL, Apr. 1994

(Contract W-7405-eng-36)

(DE94-009315; LA-UR-94-818; CONF-9404124-1) Avail: CASI HC A03/MF A01

This is a study of the microstructure of particles of an experimental high surface area carbon black (HSA) and of the morphology of the particle aggregates using small-angle neutron scattering and the method of contrast variation. Contrast variation was effected by studying suspensions of the carbon black in cyclohexane containing different fractions of deuterocyclohexane. We find that the approximately 29 nm diameter HSA particles are arranged as small, linear aggregates with average aggregation number between 4 and 6. The structure averaged over the particle population is best represented by a prolate ellipsoid of revolution with semi-axes 14.5 and 76.4 nm. The surface of the aggregates appears smooth over length scales longer than 1 nm, which places an upper limit on the surface roughness observed by other methods. The internal structure of the aggregates is described by a shell-core model, with the shell density being consistent with a graphitic structure and the core being of lower density, more like amorphous carbon. Some fraction of the core volume (0.1 to 0.2) is taken up by voids that are not accessible to the solvent. An estimate of the shell thickness gives 1 to 2 nm along the ellipsoid minor axis and 6 to 10 nm along the major axis. The particles of the aggregate appear to be fused so that the less dense amorphous core is continuous through the inner parts of the aggregate. The information that can be obtained on the internal structure using contrast variation is limited by nonheterogeneity in the chemical composition of carbon black aggregates. DOE

N94-34101# China Nuclear Information Centre, Beijing (China).

EXPERIMENTAL STUDIES OF EQUATION OF GASES STATE FOR HYDROGEN AND DEUTERIUM

Jiang Guoqiang (Sichuan Inst. of Materials and Technology, Chengdu, China.) and Lu Guangda (Sichuan Inst. of Materials and Technology, Chengdu, China.) Nov. 1992 20 p

(DE94-609877; CNIC-00692; SMI-0005) Avail: CASI HC A03/MF A01 (US Sales Only)

The low order Virial coefficient and compression factors of hydrogen, deuterium, and the mixtures of both materials were experimentally determined by using the Burnett method at the normal temperature and the pressure of 0.5 to 40 MPa. Comparing the results obtained with the data in references, the relative error of compression factor is less than 0.2%. DOE

N94-34229# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

INTERFERENCE BETWEEN PARALLEL, CONVERGENT AND DIVERGENT JET DIFFUSION FLAMES M.S. Thesis [INTERFERENCIA ENTRE CHAMAS DE DIFUSAO DE JATOS PARALELOS, DIVERGENTES E CONVERGENTES]

Victor Racy Abdalla Jun. 1993 115 p In PORTUGESE

(INPE-5542-TDI/530) Avail: CASI HC A06/MF A02

An experimental study has been made of the characteristics of interaction between the acetylene turbulent diffusion flames, with and without the addition of helium to the fuel jet. This work was made using parallel, convergent, and divergent jet configuration. The results show that an increase of the nozzle angle, for both convergent and divergent configurations, and the injection of diluent reduce the flame lengths. Author

N94-34287# Department of the Navy, Washington, DC.
EFFICIENT CHEMISTRY FOR SELECTIVE MODIFICATION AND METALLIZATION OF SUBSTRATES Patent Application
Jeffrey M. Calvert, inventor (to Navy), Charles S. Dulcey, inventor (to Navy), Timothy S. Koloski, inventor (to Navy), Brian M. Peek, inventor (to Navy), and Walter J. Dressick, inventor (to Navy) 16 Dec. 1992 34 p
(AD-D016162; US-Patent-Appl-SN-991680; Navy-Case-74943) Avail: CASI HC A03/MF A01

A process for efficient modification and metallization of substrates includes the steps of providing a substrate with highly photo-efficient chemical functional groups on at least a portion of this substrate, exposing the substrate to actinic radiation to transform, deactivate, or remove these chemical functional groups, to modify their chemical reactivity, and to perform further chemical reaction steps on these modified chemical functional groups. DTIC

N94-34684*# Clarkson Univ., Potsdam, NY. Div. of Research.
MODELLING DIRECTIONAL SOLIDIFICATION Final Report, 1 May 1991 - 31 May 1994
William R. Wilcox and Liya L. Regel 1994 43 p
(Grant NAG8-831)
(NASA-CR-195769; NAS 1.26:195769) Avail: CASI HC A03/MF A01

This grant, NAG8-831, was a continuation of a previous grant, NAG8-541. The long range goal of this program has been to develop an improved understanding of phenomena of importance to directional solidification, in order to enable explanation and prediction of differences in behavior between solidification on Earth and in space. Emphasis in the recently completed grant was on determining the influence of perturbations on directional solidification of InSb and InSb-GaSb alloys. In particular, the objective was to determine the influence of spin-up/spin-down (ACRT), electric current pulses and vibrations on compositional homogeneity and grain size. Derived from text

N94-35077* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PHENYLETHYNYL ENDCAPPING REAGENTS AND REACTIVE DILUENTS Patent
Brian J. Jensen, inventor (to NASA), Robert G. Bryant, inventor (to NASA), and Paul M. Hergenrother, inventor (to NASA) 17 May 1994 10 p
Filed 2 Apr. 1993 Supersedes N93-31459 (31 - 12, p 3702)
(NASA-Case-LAR-14796-1; US-Patent-5,312,994;
US-Patent-Appl-SN-045343; US-Patent-Class-568-306;
US-Patent-Class-568-332; US-Patent-Class-568-30; US-Patent-Class-568-34;
US-Patent-Class-568-928; US-Patent-Class-570-128;
Int-Patent-Class-C07C-205/06) Avail: US Patent and Trademark Office

A phenylethynyl composition which can be used to endcap nucleophilic species is employed in the production of phenylethynyl terminated reactive oligomers exclusively. These phenylethynyl terminated reactive oligomers display unique thermal characteristics, as exemplified by the model compound, 4-phenoxy 4'-phenylethynylbenzophenone, which is relatively stable at 200 C, but reacts at 350 C. In addition, a reactive diluent was prepared which decreases the melt viscosity of the phenylethynyl terminated oligomers and subsequently reacts therewith to increase density of the resulting thermoset. The novelty of this invention resides in the phenylethynyl composition used to terminate a nucleophilic reagent, resulting in the exclusive production of phenylethynyl terminated reactive oligomers which display unique thermal characteristics. A reactive diluent was also employed to decrease the melt viscosity of a phenylethynyl terminated reactive oligomer and to subsequently react therewith to increase the crosslink density of the resulting thermoset. These materials have features which make them attractive candidates for use as composite matrices and adhesives.
Official Gazette of the U.S. Patent and Trademark Office

N94-33483*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HSR COMBUSTION ANALYTICAL RESEARCH
H. Lee Nguyen *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 983-996 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LeRC IN-HOUSE EXPERIMENTAL RESEARCH
Valerie J. Lyons *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 999-1023 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33485*# General Electric Co., Cincinnati, OH. Aircraft Enginges.
LEAN BURN COMBUSTOR TECHNOLOGY AT GE AIRCRAFT ENGINES
Willard J. Dodds *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 1027-1042 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N94-33373# Aluminum Co. of America, Alcoa Center, PA. Technical Center.
MICROSTRUCTURALLY BASED MODEL OF FATIGUE INITIATION AND GROWTH
J. R. Brockenbrough, A. J. Hinkle, P. E. Magnusen, and R. J. Bucci 7 Apr. 1994 19 p
(Contract N00014-91-C-0128)
(AD-A278198) Avail: CASI HC A03/MF A01

A model to calculate fatigue life is developed based on the assumption that fatigue life is entirely composed of crack growth from an initial microstructural inhomogeneity. Specifically, growth is considered to start from either an ellipsoidal void, a cracked particle, or a debonded particle. The capability for predicting fatigue life from material microstructure is based on linear elastic fracture mechanics principles, the sizes of the crack-initiating microstructural inhomogeneities, and an initiation parameter that is proportional to the cyclic plastic zone size. A key aspect of this modeling approach is that it is linked with a general purpose probability program to analyze the effect of the distribution of controlling microstructural features within the material. This enables prediction of fatigue stress versus life curves for various specimen geometries using distributional statistics obtained from characterizations of the microstructure. Results are compared to experimental fatigue data from an aluminum alloy. DTIC

N94-33436# Cornell Univ., Ithaca, NY. Dept. of Chemistry.
THE UNDERPOTENTIAL DEPOSITION OF COPPER ON Pt(311): SITE SELECTIVE DEPOSITION AND ANION EFFECTS
R. Gomez, J. M. Feliu, and H. D. Abruna 14 Mar. 1994 42 p
(Contract N00014-84-K-0656)
(AD-A278022; TR-36) Avail: CASI HC A03/MF A01

The underpotential deposition of copper on Pt(311) = Pt(2(111)x(100)) stepped surfaces has been studied and the results are compared with those for the same processes on Pt(111) and Pt(100). We find that the adsorption/desorption of copper on the (111) (terrace) and (100) (steps) sites of this surface takes place at different potentials so that selective adsorption on terrace or step sites is possible. The potentials, and their relative position, are different from those on Pt(111) and Pt(100) surfaces. These differences are ascribed to competitive effects from the anions which adsorb more strongly on the (100) than on the (111) sites. In addition, the presence of halides (Cl(-), Br(-)) dramatically affects the electrodeposition process. DTIC

N94-33679 Lawrence Livermore National Lab., CA.
ELECTRONIC STRUCTURE AND STABILITY OF SIMPLE AND COMPLEX PHASES IN TRANSITION METALS
A. J. S. Traiber and P. E. A. Turchi Mar. 1994 8 p Presented at the Fall Meeting of the Minerals, Metals and Materials Society: Physical Metallurgy and Materials, Pittsburgh, PA, 17-21 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract W-7405-eng-48)

(DE94-009090; UCRL-JC-116400; CONF-931009-23) Avail: CASI HC A02

Electronic factors that explain the relative stability of simple and complex phases in transition metals are examined within a realistic tight-binding model. A repulsive pairwise interaction of the Born-Mayer type is added to the band energy term. The parameters of this short-ranged repulsive term are determined by fitting the total energy to elastic properties of the bcc-based metal. The model is further simplified by introducing the linear Green function method. The study focuses on the properties of molybdenum, correctly predicting bcc as the stable phase. DOE

N94-33680 Lawrence Livermore National Lab., CA.
EFFECT OF BORON AND HYDROGEN ON THE ELECTRONIC STRUCTURE OF NI3AI

N. Kioussis (California State Univ., Northridge, CA.), H. Watanabe (California State Univ., Northridge, CA.), R. G. Hemker (California State Univ., Northridge, CA.), W. Gourdin, A. Gonis, and P. E. Johnson 19 Nov. 1993 7 p Presented at the Fall Meeting of the Materials Research Society, Boston, MA, 29 Nov. - 3 Dec. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract W-7405-eng-48)
(DE94-009092; UCRL-JC-115772; CONF-931108-96) Avail: CASI HC A02

Using first-principles electronic structure calculations based on the Linear-Muffin-Tin Orbital (LMTO) method, we have investigated the effects of interstitial boron and hydrogen on the electronic structure of the L1(sub 2) ordered intermetallic Ni3Al. When it occupies an octahedral interstitial site entirely coordinated by six Ni atoms, we find that boron enhances the charge distribution found in the strongly-bound 'pure' Ni3Al crystal: Charge is depleted at Ni and Al sites. Substitution of Al atoms for two of the Ni atoms coordinating the boron, however, reduces the interstitial charge density between atomic planes. In contrast to boron, hydrogen appears to deplete the interstitial charge, even when fully coordinated by Ni atoms. We suggest that these results are broadly consistent with the notion of boron as a cohesion enhancer and hydrogen as an embrittler. DOE

N94-33741 Materials Research Society, Pittsburg, PA.
HIGH TEMPERATURE SILICIDES AND REFRACTORY ALLOYS SYMPOSIUM, VOLUME 322

C. L. Briant, J. J. Petrovic, B. P. Bewlay, A. K. Vasudevan, and H. A. Lipsitt 2 Dec. 1993 581 p Symposium held in Boston, MA, 29 Nov. - 2 Dec. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0741)
(AD-A278373) Avail: CASI HC A25

Partial contents: plastic behavior and deformation structure of silicide single crystals with transition metals at high temperatures; the temperature and strain rate dependence of the flow stress in MoSi2 single crystals; characterization of structure and mechanical properties of MoSi2-SiC nanolayer composites; synthesis and properties of in-situ MoSi2/SiC composites; the effect of deformation and reinforcement particles on the grain growth behavior of MoSi2; C11(sub B)-C40 transformation-induced 1/4 group of zone axes (111) faults in MoSi2; in-situ processing of MoSi2-base composites; and vacuum plasma spray forming of high temperature silicides. DTIC

N94-33758 Department of the Navy, Washington, DC.
STAINLESS STEEL SURFACE TREATMENT Patent

Georgette B. Gaskin, inventor (to Navy), Gabriel J. Pilla, inventor (to Navy), Stanley R. Brown, inventor (to Navy), and Robert B. Bonk, inventor (to Navy) 4 Jan. 1994 3 p Filed 3 May 1993
(AD-D016135; US-Patent-5,275,696; US-Patent-Appl-SN-057370; US-Patent-Class-156-664) Avail: US Patent and Trademark Office

A process for preparing a stainless steel surface for bonding to an adhesive is described. First, the surface is wiped with a solvent and then soaked in an alkaline bath at an elevated temperature to remove dirt and grease. The surface is then rinsed with water and immersed in a 135 deg F to 145 deg F solution containing from 25 to 35 volume-percent sulfuric acid in water for a period of time equal to the length of time it takes for a reaction on the surface to commence plus about 4 to 8 minutes. Next, the surface is immersed in a solution at ambient temperature containing from 28 to 35 volume-percent nitric acid and from 2 to 3 volume-percent hydrofluoric acid in water for about 4 to 8 minutes, and then rinsed with water and dried. DTIC

N94-33870# Japan Atomic Energy Research Inst., Tokyo (Japan).
DEVELOPMENT OF HIGH TEMPERATURE PROPERTY DATABASE FOR ALLOY 800H

Norio Yokoyama, Katsutoshi Watanabe, Hirokazu Tsuji, and Hajime Nakajima Jul. 1993 41 p
(DE94-727589; JAERI-M-93-148) Avail: CASI HC A03/MF A01

JAERI Material Performance Database (JMPD) has been developed since 1989 in JAERI with a view to utilizing the various kinds of characteristic data of nuclear materials efficiently. Using a relational database management system, PLANNER on the mainframe, the JMPD provides the retrieval supporting system, graphic and statistical analyses system. The data obtained with 7868 sets on characteristic data of metallic materials, including fatigue crack growth data, etc., have been stored in the JMPD at the end of March in 1993. A ferritic superalloy, Alloy 800H is used for the structural material of the control rods of the High Temperature Engineering Test Reactor (HTTR). Thermal stress generation might cause a severe creep damage at a reactor scram. It therefore needs to be designed with consideration on the fracture modes induced by creep deformation after neutron irradiation. The creep data (approximately 240 sets) and tensile data (approximately 100 sets) of Alloy 800H including the effects of test environment, aging treatment and neutron irradiation, have been stored in the JMPD. Furthermore, using a personal computer, a high temperature property database for Alloy 800H has been developed. The present report outlines the development of this high temperature property database for Alloy 800H. DOE

N94-33880# Oak Ridge National Lab., TN.
SOLIDIFICATION MICROSTRUCTURES IN SINGLE-CRYSTAL STAINLESS STEEL MELT POOLS

J. B. Sipf, L. A. Boatner, and S. A. David Mar. 1994 211 p
(Contract DE-AC05-84OR-21400)
(DE94-009839; ORNL/TM-12623) Avail: CASI HC A10/MF A03

Development of microstructure of stationary melt pools of oriented stainless steel single crystals (70%Fe-15%Ni-15%Cr) was analyzed. Stationary melt pools were formed by electron-beam and gas-tungsten-arc heating on (001), (011), and (111) oriented planes of the austenitic, fcc-alloy crystals. Characterization and analysis of resulting microstructure was carried out for each crystallographic plane and welding method. Results showed that crystallography which favors 'easy growth' along the (100) family of directions is a controlling factor in the microstructural formation along with the melt-pool shape. The microstructure was found to depend on the melting method, since each method forms a unique melt-pool shape. These results are used in making a three-dimensional reconstruction of the microstructure for each plane and melting method employed. This investigation also suggests avenues for future research into the microstructural properties of electron-beam welds as well as providing an experimental basis for mathematical models for the prediction of solidification microstructures. DOE

N94-33933# Japan Atomic Energy Research Inst., Tokyo (Japan).
CREEP RUPTURE PROPERTIES UNDER VARYING LOAD AND TEMPERATURE CONDITIONS ON A NICKEL-BASE HEAT-RESISTANT ALLOY STRENGTHENED BY BORON ADDITION

Hirokazu Tsuji, Hajime Nakajima, and Tatsuhiko Tanabe Sep. 1993 26 p
(DE94-727594; JAERI-M-93-173) Avail: CASI HC A03/MF A01

A series of constant load and temperature creep rupture tests and varying load and temperature creep rupture tests was carried out on Hastelloy XR whose boron content level is 60 mass ppm at 900 and 1000 C in order to examine the behavior of the alloy under varying load and temperature conditions. The life fraction rule completely fails in the prediction of the creep rupture life under varying load and temperature conditions though the rule shows good applicability for Hastelloy XR whose boron content level is below 10 mass ppm. The modified life fraction rule has been proposed based on the dependence of the creep rupture strength on the born content level of the alloy. The modified rule successfully predicts the creep rupture life under the test conditions from 1000 C to 900 C. The trend observed in the tests from 900 C to 1000 C can be qualitatively

explained by the mechanism that the oxide film which is formed during the prior exposure to 900 C plays the role of the protective barrier against the boron dissipation into the environment. DOE

N94-34014# Sandia National Labs., Albuquerque, NM.
ION BEAM SURFACE TREATMENT: A NEW CAPABILITY FOR RAPID MELT AND RESOLIDIFICATION OF SURFACES
R. W. Stinnett, D. C. McIntyre, R. G. Buchheit, J. B. Greenly, and M. O. Thompson 1994 7 p Presented at the 16th International Symposium on Discharges and Electrical Insulation in Vacuum: Commercial Applications and Opportunities, Moscow, Russia, 23-20 May 1994
(Contract DE-AC04-94AL-85000)
(DE94-008955; SAND-94-0093C; CONF-9405116-1) Avail: CASI HC A02/MF A01

The emerging capability to produce high average power (5-250 kW) pulsed ion beams at 0.2-2 MeV energies is enabling us to develop a new, commercial-scale thermal surface treatment technology called Ion Beam Surface Treatment (IBEST). This technique uses high energy, pulsed (less than or equal to 100 ns) ion beams to directly deposit energy in the top 2-20 micrometers of the surface of any material. Depth of treatment is controllable by varying the ion energy and species. Deposition of the energy with short pulses in a thin surface layer allows melting of the layer with relatively small energies and allows rapid cooling of the melted layer by thermal diffusion into the underlying substrate. Typical cooling rates of this process (10(exp 9)-10(exp 10) K/sec) cause rapid resolidification, resulting in production of non-equilibrium microstructures (nano-crystalline and metastable phases) that have significantly improved corrosion, wear, and hardness properties. We have conducted IBEST feasibility experiments with results confirming surface hardening, nanocrystaline grain formation, metal surface polishing, controlled melt of ceramic surfaces, and surface cleaning. DOE

N94-34152 Department of the Navy, Washington, DC.
METHOD FOR PRODUCING CLOSED CELL SPHERICAL POROSITY IN SPRAY FORMED METALS Patent
Paul Kelley, inventor (to Navy) 30 Nov. 1993 12 p Filed 11 Aug. 1992
(AD-D016126; US-Patent-5,266,099; US-Patent-Appl-SN-927991; US-Patent-Class-75/337) Avail: US Patent and Trademark Office

Metal and metal alloy preforms having closed cell, spherical porosity are spray formed at high deposition rates by introducing blowing agents into the thixotropic semisolid deposition layer, within which gas formed in thermal decomposition reactions are trapped. Density reductions of nearly 30% were generated in a phosphor bronze matrix, using barium carbonate as the blowing agent. Hollow glass particles were produced in the same matrix alloy by injection of microsphere precursor frit containing sulfur. A simple Newtonian heat transfer model of agent heating in the spray predicts agent/matrix compatibility. Along with modest improvements in damping capacity, tensile and compressive properties were found to be equal or superior to powder metallurgy product at the same porosity levels. DTIC

N94-34170*# Michigan Technological Univ., Houghton, MI. Dept. of Metallurgical and Materials Engineering.
C.A.D. REPRESENTATION OF TERNARY AND QUATERNARY PHASE DIAGRAMS Final Technical Report
James D. DeLaO 1986 17 p
(Contract NCC3-183)
(NASA-CR-195845; NAS 1.26:195845) Avail: CASI HC A03/MF A01

This work is concerned with the utilization of C.A.D. solid-modeling software for the computer representation of three-dimensional phase diagrams. The work was undertaken in two parts. First, the C.A.D. software (I-DEAS, by Structural Dynamics Research Corp.) was integrated with a variety of auxiliary Fortran 77 and I-DEAS language programs which were written specifically for the purpose of phase diagram representation. The capabilities of the resulting suite of software for three-dimensional phase diagram representation were developed and illustrated by the construction, display and manipulation of solid-model phase diagrams for a hypothetical quaternary eutectic system. The results of this work are discussed in some detail in the attached publication ('Solid-modeling: a C.A.D. Alternative for Three-dimensional Phase Diagram Representation'). Such a technique is of general applicability, having utility in both research and education. Secondly, using the C.A.D. technique, data from the literature (gleaned from some 70 separate publications), which represent experimentally determined phase boundaries, were combined to form solid-model representations of the CMS2-M2S-S ternary space diagram and the CMS2-CAS2-M2S-S quaternary liquidus projection (where C=CaO, M=MgO, A=Al2O3, and S=SiO2). These diagrams were utilized in a concurrent study of solidification in the CMAS system. Derived from text

N94-34396*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE EFFECTS OF PHYSICAL AGING AT ELEVATED TEMPERATURES ON THE VISCOELASTIC CREEP ON IM7/K3B
Thomas S. Gates and Mark Feldman Jun. 1994 38 p Presented at the ASTM 12th Symposium on Composite Materials: Testing and Design, Montreal, Ontario, 16-17 May 1994
(RTOP 505-63-50-04)
(NASA-TM-109114; NAS 1.15:109114) Avail: CASI HC A03/MF A01

Physical aging at elevated temperature of the advanced composite IM7/K3B was investigated through the use of creep compliance tests. Testing consisted of short term isothermal, creep/recovery with the creep segments performed at constant load. The matrix dominated transverse tensile and in-plane shear behavior were measured at temperatures ranging from 200 to 230 C. Through the use of time based shifting procedures, the aging shift factors, shift rates and momentary master curve parameters were found at each temperature. These material parameters were used as input to a predictive methodology, which was based upon effective time theory and linear viscoelasticity combined with classical lamination theory. Long term creep compliance test data was compared to predictions to verify the method. The model was then used to predict the long term creep behavior for several general laminates. Author

N94-34397*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
MICROMECHANICAL CHARACTERIZATION OF NONLINEAR BEHAVIOR OF ADVANCED POLYMER MATRIX COMPOSITES
Thomas S. Gates, J. L. Chen, and C. T. Sun Jun. 1994 39 p Presented at the ASTM 12th Symposium on Composite Materials: Testing and Design, Montreal, Ontario, 16-17 May 1994
(RTOP 505-63-50-04)
(NASA-TM-109129; NAS 1.15:109129) Avail: CASI HC A03/MF A01

Due to the presence of curing stresses and oriented crystalline structures in the matrix of polymer matrix fiber composites, the in situ nonlinear properties of the matrix are expected to be rather different from those of the bulk resin. A plane stress micromechanical model was developed to retrieve the in situ elastic-plastic properties of Narmco 5260 and Amoco 8320 matrices from measured elastic-plastic properties of IM7/5260 and IM7/8320 advance composites. In the micromechanical model, the fiber was assumed to be orthotropically elastic and the matrix to be orthotropic in elastic and plastic properties. The results indicate that both in situ elastic and plastic properties of the matrices are orthotropic. Author

N94-34398*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OXIDATION PERFORMANCE OF PLATINUM-CLAD Mo-47Re ALLOY
Ronald K. Clark and Terryl A. Wallace Jun. 1994 11 p
(RTOP 763-23-41-92)
(NASA-TM-4559; L-17297; NAS 1.15:4559) Avail: CASI HC A03/MF A01

The alloy Mo-47Re has favorable mechanical properties at temperatures above 1400 C, but it undergoes severe oxidation when used in air with no protective coating. To shield the alloy from oxidation, platinum cladding has been evaluated. The unprotected alloy undergoes catastrophic oxidation under static and dynamic oxidation conditions. The platinum cladding provides good protection from static and dynamic oxidation for moderate times at 1260 C. Samples tested for longer times under static oxidation conditions experienced severe oxidation. The data suggest that oxidation results from the transport of oxygen through the grain boundaries and through the pinhole defects of the platinum cladding. Author

N94-34346# Kunming Inst. of Tech. (China). Dept. of Automation.
A DYNAMIC MODEL OF THE VACUUM FURNACE FOR SEPARATING Pb FROM Sn-Pb ALLOY
Xiang-Zhen Zeng and Li-Hui Feng *In* Nanjing Aeronautical Inst.,

Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 169-172 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials.*

N94-33408 Richerson and Associates, Salt Lake City, UT.
CONTINUOUS FIBER CERAMIC COMPOSITE PROGRAM, PHASE 1 Technical Progress Report, Feb. 1994
D. W. Richerson 15 Mar. 1994 34 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC05-84OR-21400)
(DE94-009180; DOE/OR-2003; ORNL/M-3336) Avail: CASI HC A03

United States industry has a critical need for materials that are lightweight, strong, tough, corrosion resistant, and capable of performing at high temperatures; such materials will enable a substantial increase in energy efficiency and reduction in emissions of pollutants. Continuous fiber ceramic composites (CFCC's) are an emerging class of materials which have the potential for the desired combination of properties to meet the industrial needs. A $10 billion annual market has been estimated for CFCC products by the year 2010, which equates to over 100,000 industrial sector jobs. The CFCC program began in the spring of 1992 as a three-phase, 10-year effort to accomplish the following: assess potential applications of CFCC materials; develop the necessary supporting technologies to design, analyze, and test CFCC materials; conduct materials and process development guided by the applications assessment input; fabricate test samples and representative components to evaluate CFCC material capabilities under application conditions; and analyze scaleability and manufacturability plus demonstrate pilot-scale production engineering. DOE awarded 10 phase 1 cooperative agreements to industry-lead teams plus identified generic supporting technology projects. This document highlights the broad progress and accomplishments on these contracts and support technology projects during phase 1. DOE

N94-33429 Rome Lab., Griffiss AFB, NY.
ATOMIC FORCE MICROSCOPY Report, Oct. 1991 - Jun. 1993
Joseph V. Beasock Dec. 1993 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AF Proj. LDFP)
(AD-A277589; RL-TR-93-252) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Atomic Force Microscopy (AFM) has been used to study the surface microstructure of aluminum metallization. The effects of plasma cleaning and annealing on the surface structure of aluminum are shown and discussed. A brief description of the theories of Atomic Force Microscopy (AFM) and Scanning Tunneling Microscopy (STM) is given. The technique of AFM, the importance of tip geometry and sample orientation on image appearance and the significance of edge/tip interaction on interpretation of AFM data are discussed. Atomic level imaging capability of AFM is also demonstrated. DTIC

N94-33438 Army Research Lab., Watertown, MA. Materials Directorate.
FLOODED CELL PERMEATION TESTING OF ELASTOMERS Progress Report
James M. Sloan and Stephen C. Bodnar Mar. 1994 19 p Presented at the American Chemical Society Meeting, Orlando, FL, 26-29 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277698; ARL-TR-339) Avail: CASI HC A03

Permeation studies were carried out using a flooded radian test cell to follow the diffusion of an organic liquid through a polymer barrier. The experimental apparatus consists of a MiniCAMS (Miniature Continuous Air Monitoring System) equipped with a sulfur detector which has the capability of detecting nanogram quantities of permeant at breakthrough. The results yield a time dependent sigmoidal curve that allows determination of the solubility and diffusion coefficients as well as a breakthrough time. DMSO was selected as the test permeant as it is a low swelling solvent which is very sensitive toward detection by the sulfur GC detection system. This method was used to characterize the permeation properties of a number of elastomer systems including sulfur cured natural rubber (NR), sulfur cured styrene-butadiene rubber (SBR), thiourea cured hydrin (EC) elastomer, oxide cured neoprene (CR), sulfur cured nitrile rubber (NBR), and cured fluorocarbon elastomer (FR). DTIC

N94-33446 Army Research Lab., Watertown, MA. Materials Directorate.
DIFFUSION AND SORPTION OF 1,4-DIOXANE INTO POLYCHLOROPRENE Final Report
Geralda Severe Dec. 1993 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277743; ARL-TR-338) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Influence of the presence of plasticizer on the transport properties for the polychloroprene/ 1,4-dioxane (Neoprene/1,4-dioxane) system has been investigated. The sorption rate curves for the extracted and the unextracted (as received) Neoprene demonstrated some characteristics of Fickian behavior. The sorption isotherms obtained from the weight uptake did not coincide for repeated runs of the extracted sample; they were below the isotherm of the unextracted sample. However, both types of samples (extracted and unextracted Neoprene) showed diffusion coefficients that increase with concentration. The difference between the diffusion coefficients for the extracted and unextracted Neoprene was not significant; the extraction primarily affected the solubility. DTIC

N94-33539 Illinois Univ., Urbana, IL. Dept. of Materials Science and Engineering.
DISPLACIVE TRANSFORMATION IN CERAMICS Final Report, 15 Mar. 1990 - 30 Sep. 1993
W. M. Kriven, C. M. Wayman, D. A. Payne, H. Chen, and J. D. Bass 28 Feb. 1994 565 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0174-90)
(AD-A278442; AFOSR-94-0151TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

An interdisciplinary study of displacive phase transformations in ceramics has been undertaken. The unifying themes were to obtain an in-depth understanding of nucleation and transformation mechanisms. The ceramic systems focused on, and studied from different perspective, included lead titanate (PbTiO3), potassium niobate (KNbO3), yttrium barium copper oxide (YBa2Cu3O(6+x)) and dicalcium silicate (Ca2SiO4). The cubic to tetragonal transformation in PbTiO3 was proven to be martensitic, and the experimental observations illustrated a predicted theoretical mechanism of common habit plane variants which had not yet been observed in any other system. Shape memory and superelasticity effects were discovered in doped PbTiO3 ceramics which exhibited field-induced antiferroelectric to ferroelectric transformations. The effect of oxygen partial pressures on the transformation mechanism and microstructure in YBa2Cu3O(6+x) single crystals, leading to elastic deformation, has been ascertained. A comprehensive understanding of the complex sequence of ferroelastic transformations in Ca2SiO4 with volume changes up to 12% has been achieved. For the first time, a case study of martensitic nucleation in a KNbO3 ceramic has almost been assembled, with complementary aspects of theoretical lattice dynamics, phonon properties, (RT) elastic moduli and in situ hot stage TEM microstructural studies having been determined prior to and during transformation. DTIC

N94-33683 Los Alamos National Lab., NM.
EXPERIMENTAL OBSERVATIONS OF THERMAL SPIKES IN MICROWAVE PROCESSING OF CERAMIC OXIDE FIBERS
G. J. Vogt, W. P. Unruh, and J. R. Thomas, Jr. 1994 7 p Presented at the Spring Meeting of the Materials Research Society, San Francisco, CA, 4-8 Apr. 1994 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract W-7405-eng-36)
(DE94-009348; LA-UR-94-986; CONF-940411-5) Avail: CASI HC A02

Microwave heating of alumina/silica fiber tows in a single-mode microwave cavity at 2.45 GHz have produced a surprising thermal spike

behavior on the fiber bundles. During a thermal spike, a 'hot spot' on the tow brightens rapidly, persists for a few seconds, and rapidly extinguishes. A hot spot can encompass the entire tow in the cavity or just a localized portion of the tow. Some local hot spots propagate along the fiber. Thermal spikes are triggered by relatively small (less than 15%) increases in power, thus having obvious implications for the development of practical microwave fiber processing systems. A tow can be heated through several successive thermal spikes, after which the tow is left substantially cooler than it was originally, although the applied microwave electric field is much larger. X-ray diffraction studies show that after each temperature spike there is a partial phase transformation of the tow material into mullite. After several excursions the tow has been largely transformed to the new, less lossy phase and is more difficult to heat. Heating experiments with Nextel 550 tows are examined for a plausible explanation of this microwave heating behavior. DOE

N94-33697 Department of the Navy, Washington, DC.
POLYURETHANE SELF-PRIMING TOPCOATS Patent Application
Charles Hegedus, inventor (to Navy), Donald Hirst, inventor (to Navy), and Anthony Eng, inventor (to Navy) 29 Sep. 1992 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016131; US-Patent-Appl-SN-953413; Navy-Case-74079) Avail: CASI HC A03

Described is a corrosion-resistant coating which can be applied directly to a surface as a self-priming topcoat comprising a polyurethane resin binder and a combination of pigments consisting essentially of an alkaline earth metal metaborate, zinc salts of benzoic acids, and an alkaline earth metal phosphate such as zinc-barium phosphate. In addition, the coating contains from 5 - 40 parts by weight of a titanium dioxide pigment, up to about 3.0 parts by weight of an oil soluble dispersant, and up to about 50 parts by weight of at least one organic solvent. DTIC

N94-33747# Ceramatec, Inc., Salt Lake City, UT.
NEW MECHANISM FOR TOUGHENING CERAMIC MATERIALS Final Report, 15 Mar. 1989 - 15 Jul. 1993
Raymond A. Cutler, Anil V. Virkar, L. E. Cross, and Fred F. Lange Feb. 1994 264 p
(Contract F49620-89-C-0054; DARPA Order 5994)
(AD-A278479; AFOSR-94-0152TR) Avail: CASI HC A12/MF A03

Ferroelastic toughening was identified as a viable mechanism for toughening ceramics. Domain structure and domain switching was identified by x ray diffraction, transmission optical microscopy, and transmission electron microscopy in zirconia, lead zirconate titanate, and gadolinium molybdate. Switching in compression was observed at stresses greater than 600 MPa and at 400 MPa in tension for polycrystalline t'-zirconia. Domain switching contributes to toughness, as evidenced by data for monoclinic zirconia, t'-zirconia, PZT, and GMO. The magnitude of toughening varied between 0.6 MPa m(exp 1/2) for GMO to 2-6 MPa m(exp 1/2) for zirconia. Polycrystalline monoclinic and t'-zirconias, which showed no transformation toughening, had similar toughness values as Y-TZP which exhibits transformation. Coarse-grained monoclinic and tetragonal (t') zirconia samples could be cooled to room temperature for mechanical property evaluation since fine domain size, not grain size, controlled transformation for t'-zirconia and minimized stress for m-ZrO2. LnAlO3, LnNbO4, and LnCrO3 were among the materials identified as high temperature ferroelastics. DTIC

N94-33762 Department of the Navy, Washington, DC.
ENERGETIC POLYMER Patent
Horst G. Adolph, inventor (to Navy) and Donna M. Cason-Smith, inventor (to Navy) 30 Nov. 1993 5 p Filed 13 Jul. 1992
(AD-D016156; US-Patent-5,266,675; US-Patent-Appl-SN-912420; US-Patent-Class-528-230) Avail: US Patent and Trademark Office

Accordingly, an object of this investigation is to provide new energetic polymers for use in propellant and explosive binders. Another object of this invention is to provide new energetic polymers that are more stable to heat and light. A further object of this invention is to provide new stable energetic polymers that are less expensive to produce. These and other objects of this invention are achieved by producing: a dihydroxy-terminated copolyformal formed from (A) formaldehyde and (B) a diol comonomer mixture of a nitraminediol. DTIC

N94-33772 University of Southern Illinois, Carbondale, IL. Dept. of Chemistry and Biochemistry.
SYMPOSIUM ON INORGANIC AND ORGANOMETALLIC POLYMERS Final Technical Report
Patty Wisian-Neilson 2 Apr. 1993 12 p Symposium held in Denver, CO, 29 Mar. - 2 Apr. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0073)
(AD-A277860) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A partial listing of the contents of this document includes the following: Anionic Polymerization of Masked Disilenes to Polysilylenes--Mechanism and Applications; Electrochemical Access to Di, Tri, and Polysilanes; Stereoregular Polysilanes by Ring-Opening Polymerization; Polysilazane Thermosets as Precursors for Silicon Carbide and Silicon Nitride; Substituent Effects on the UV Absorption of Delta-Conjugated Polysilanes; Surface Properties of Polydimethylsiloxane Urea Urethane Copolymers with 1,4 Benzenedimethanol as Chain Extender; Silicon Containing Resist Materials Based on Chemical Amplification; Structure-Property Relationships in Sol-Gel-Derived Thin Films; Porous Materials By Design; Plasma Oxidation of Hydrocarbon Templates in Polysilsesquioxanes; and Sol-Gel Synthesis of Heterometallic Oxopolymers. DTIC

N94-33872# Japan Atomic Energy Research Inst., Tokyo (Japan).
THERMAL CYCLIC OXIDATION BEHAVIOR OF THE DEVELOPED COMPOSITIONALLY GRADIENT GRAPHITE MATERIAL OF SiC AND C IN AIR ENVIRONMENT
Junichi Nakano, Kimio Fujii, and Masami Shindo Aug. 1993 25 p
(DE94-727591; JAERI-M-93-159) Avail: CASI HC A03/MF A01

For the developed compositionally gradient graphite material composed of surface SiC coating layer, middle SiC/C layer and graphite matrix, the thermal cyclic oxidation test was performed together with two kinds of the SiC coated graphite materials in an air environment. It was made clear that the developed material exhibited high performance under severe thermal cyclic conditions, independent of the morphology of middle SiC/C layers, and had the longer time or the more cycle margins from crack initiation to failure for surface SiC coating layer compared with the SiC coated graphite materials. DOE

N94-33881# Oak Ridge National Lab., TN.
HIGH TEMPERATURE MATERIALS LABORATORY SIXTH ANNUAL REPORT, OCTOBER 1992 - SEPTEMBER 1993
V. J. Tennery and F. M. Foust Dec. 1993 80 p
(Contract DE-AC05-84OR-21400)
(DE94-009840; ORNL/TM-12647) Avail: CASI HC A05/MF A01

The High Temperature Materials Laboratory has completed its sixth year of operation as a designated Department of Energy User Facility at the Oak Ridge National Laboratory. Growth of the User Program is evidenced by the number of outside institutions executing user agreements since the facility began operation in 1987. A total of 172 nonproprietary agreements (88 university and 84 industry) and 35 proprietary agreements, (2 university, 33 industry) are now in effect. Six other government facilities have also participated in the User Program. Thirty-eight states are represented by these interactions. Ninety-four nonproprietary research proposals (44 from universities, 47 from industry, and 3 from other government facilities) and three proprietary proposals were considered during this reporting period. Nonproprietary research projects active in FY 1993 are summarized. DOE

N94-33894 Army Research Lab., Watertown, MA. Materials Directorate.
MODELING THE IMPACT BEHAVIOR OF HIGH STRENGTH CERAMICS Final Report
A. M. Rajendran Dec. 1993 42 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277744; ARL-TR-224) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

An advanced constitutive model is used to describe the shock and high strain rate behaviors of silicon carbide (SC), boron carbide B4C, and titanium diboride (TiB2) under impact loading conditions. The model's governing equations utilize a set of microphysically-based constitutive relationships to model the deformation and damage processes in a ceramic. The total strain is decomposed into elastic, plastic, and microcracking components. The plastic strain component was calculated using conventional

viscoplastic equations. The strain components due to microcracking utilized relationships derived for a penny-shaped crack containing elastic solids. The main features of the model include degradation of strength and stiffness under both compressive and tensile loading conditions. When loaded above the Hugoniot elastic limit (HEL), the strength is limited by the strain rate dependent strength equation. However, below the HEL, the strength variation with respect to strain rate and pressure is modeled through microcracking relationships assuming no plastic flow. The ceramic model parameters were determined using a set of VISAR data from the plate impact experiments. DTIC

N94-33919# Utah Univ., Salt Lake City, UT.
FABRICATION, PHASE TRANSFORMATION STUDIES, AND CHARACTERIZATION OF SiC-AlN-Al2OC CERAMICS
A. V. Virkar 28 Feb. 1994 4 p
(Contract DE-FG02-87ER-45286)
(DE94-009649; DOE/ER-45286/6) Avail: CASI HC A01/MF A01

Principal focus was on phase transformation, microstructure development, and elevated temperature creep, with some effort on room temperature mechanical properties, of selected materials. Fabrication was largely hot pressing, although many of the compositions can be densified by pressureless sintering; hot pressing was to ensure full attainment of density with fine microstructure. Most of the work was on SiC-AlN and AlN-Al2OC pseudobinaries. DOE

N94-33926# Sandia National Labs., Albuquerque, NM.
TECHNIQUES FOR THE EVALUATION OF OUTGASSING FROM POLYMERIC WAFER PODS
D. C. McIntyre, A. Liang, S. M. Thornberg, S. F. Bender, R. D. Lujan, R. S. Blewer, and W. D. Bowers 1994 5 p Presented at the Contamination Control Strategies Conference, Austin, TX, 28 Feb. 1994
(Contract DE-AC04-94AL-85000)
(DE94-008427; SAND-94-0635C; CONF-940267-1) Avail: CASI HC A01/MF A01

In recent years there has been increasing interest in using wafer-level isolation environments or pods (microenvironments) to provide a more controllable, cleaner wafer environment during wafer processing. It has been shown that pods can be effective in reducing the amount of particulate contamination on wafers during manufacturing. However, there have also been studies that indicate that pods and wafer boxes can be the source of condensible, molecular organic contamination. This paper summarizes the work that has been performed during the past year at Sandia National Laboratories' Contamination Free Manufacturing Research Center (CFMRC) on (1) devising standard, low-temperature, high sensitivity techniques to detect outgassing of volatile organic compounds (VOCs) from polymers used to construct wafer pods, and (2) development of a technique that can be used to continuously measure the condensible contamination within pods so that the pod environment can be monitored during manufacturing. Although these techniques have been developed specifically for assessing contamination threats from wafer pods, they can be used to evaluate other potential contamination sources. The high sensitivity outgassing techniques can be used to evaluate outgassing of volatiles from other clean-room materials and the real-time outgassing sensor can be used to monitor contamination condensation in non-pod environments such as ballroom-type cleanrooms and minienvironments. DOE

N94-33930# Oak Ridge National Lab., TN.
TENSILE STRENGTH OF DRIED GELCAST GREEN BODIES
S. D. Nunn, O. O. Omatete, C. A. Walls, and D. L. Barker 1994 6 p Presented at the 18th Annual Conference on Composites and Advanced Ceramics, Cocoa Beach, FL, 9-14 Jan. 1994
(Contract DE-AC05-84OR-21400)
(DE94-009453; CONF-940135-4) Avail: CASI HC A02/MF A01

Ceramic green bodies were prepared by three different techniques: dry pressing, slip casting, and gelcasting. The tensile strength of the green bodies was measured using a diametral compression test. It was found that the gelcast samples were from 2 to 20 times stronger than the conventionally formed green bodies. SEM examination of the gelcast samples revealed a homogeneous, brittle fracture surface indicating a very uniform distribution of the binder and excellent dispersion of the ceramic powder. DOE

N94-34011# Brookhaven National Lab., Upton, NY.
POROSITY IN PLASMA SPRAYED ALUMINA COATINGS
J. Ilavsky (State Univ. of New York, Stony Brook.), H. Herman (State Univ. of New York, Stony Brook.), C. C. Berndt (State Univ. of New York, Stony Brook.), A. N. Goland, G. G. Long, S. Krueger, and A. J. Allen 1994 7 p Presented at the 1994 National Thermal Spray Conference, Boston, MA, 20-24 Jun. 1994
(Contract DE-AC02-76CH-00016)
(DE94-008874; BNL-60151; CONF-940684-3) Avail: CASI HC A02/MF A01

Small-angle neutron scattering (SANS) was used to study the porosity of plasma sprayed deposits of alumina in as-sprayed and heat-treated conditions. SANS results were compared with mercury intrusion porosimetry (MIP) and water immersion techniques. Multiple small-angle neutron scattering yields a volume-weighted effective pore radius (R(sub eff)), for pores with sizes between 0.08 and 10(mu)m, the pore volume in this size region, and from the Porod region, the surface area of pores of all sizes. DOE

N94-34069# Sandia National Labs., Albuquerque, NM.
THERMAL STABILITY STUDIES OF DIAMOND-LIKE CARBON FILMS
J. E. Parmeter, D. R. Tallant, and M. P. Siegal 1994 6 p Presented at the Spring Meeting of the Materials Research Society, San Francisco, CA, 4-8 Apr. 1994
(Contract DE-AC04-94AL-85000)
(DE94-009280; SAND-94-0865C; CONF-940411-6) Avail: CASI HC A02/MF A01

Thin films of amorphous carbon/hydrogen, also known as diamond-like carbon or DLC, are of interest as an economical alternative to diamond in a variety of coatings applications. We have investigated the thermal stability of DLC films deposited onto tungsten and aluminum substrates via plasma CVD of methane. These films contain approximately 40 atom % hydrogen, and based on Auger spectra the carbon in the films is estimated to be 60% sp(sup 3) hybridized and 40% sp(sup 2) hybridized. Thermal desorption, Auger, and Raman measurements all indicate that the DLC films are stable to 250-300C. Between 300 and 500C, thermal evolution of hydrogen from the films is accompanied by the conversion of carbon from sp(sup 3) to sp(sup 2) hybridization, and Raman spectra indicate the conversion of the overall film structure from DLC to micro-crystalline graphite or so called 'glassy' carbon. These results suggest that DLC of this type is potentially useful for applications in which the temperature does not exceed 250C. DOE

N94-34076*# Auburn Univ., AL. Nuclear Science Center.
SPUTTER PROCESS INVESTIGATION: MATERIAL AND ENVIRONMENT INTERACTION PROCESSES INVESTIGATION Final Technical Report
John R. Williams, Michael J. Bozack, and Albert T. Fromhold 16 Mar. 1994 8 p
(Contract NAS8-39131)
(NASA-CR-193946; NAS 1.26:193946) Avail: CASI HC A02/MF A01

The multilayer Ellipsometry program has been developed with which the thickness and the optical properties of top layer can be determined with the additional information obtained from other measurement such as the optical constant of the middle layer film. Once the proper parameters are input into the program, the multilayer Ellipsometry program which was developed by H. Kim and Dr. Fromhold gives the best possible set of the solutions for the top layer thickness or its optical index graphically on a PC screen. In this report the basic two layer Ellipsometry theory will be summarized briefly as well as the one layer case. All the code is written in Microsoft Quickbasic version 4.5 for IBM PC with a VGA color graphics monitor so that the measurement could be cross-checked out graphically on the screen. Derived from text

N94-34087# Optical Polymer Research, Inc., Gainesville, FL.
PROPOSAL TO PRODUCE NOVEL, TRANSPARENT RADIATION HARD LOW REFRACTIVE INDEX Final Report, 1 Oct. - 31 Dec. 1993
Paul D. Schuman and Julie Harmon 9 Feb. 1994 22 p
(Contract F49620-93-C-0038)
(AD-A278476; AFOSR-94-0146TR) Avail: CASI HC A03/MF A01

Low and high molecular weight polymers of heptafluorobutyl methacrylate, HFBM, were prepared for commercial evaluation by Bicron, an optical fiber manufacturer. Polymers were evaluated as low refractive

index fiber cladding materials. Test results of Low MW polymer solutions gave excellent results. Higher MW polymers were prepared for cladding by melt co-extrusion. Corning Glass Corp, also expressed an interest in these cladding materials. These results appear to be sufficiently unique that a search has been initiated to determine patentability of the soluble fluorocarbon acrylate, methacrylate, and copolymer compositions for cladding use. Our research resulted in identifying a radiation hard, low refractive index polymer, poly(heptafluorobutyl methacrylate), P(HFBM) as the best candidate for a novel cladding material. P(HFBM) has a refractive index of 1.387. When used to clad a styrene core, the theoretical light propagation efficiency is 50% greater than that of styrene a fiber core clad with PMMA, a common commercial cladding material. These polymers will be the only commercial fluorocarbon acrylic cladding polymers available to U.S. manufacturers. Japanese optical fiber manufacturers produce fluorocarbon clad fibers but their polymers are not available to U.S. manufacturers. These polymers can fill an urgent need in the optical fiber market. DTIC

N94-34102# Umea Univ. (Sweden). Dept. of Medical Biochemistry and Biophysics.

ADHESION OF PHOSPHOLIPID MONOLAYERS TO PLANAR SUPPORTS DEPOSITED WITH THE LANGMUIR-BLODGETT TECHNIQUE Thesis

P. A. Ohlsson Dec. 1993 106 p Sponsored by National Defence Research Establishment

(PB94-148699; FOA-C-40316-4.6) Avail: CASI HC A06/MF A02

The Langmuir-Blodgett technique was used to deposit a monolayer of biologically relevant lipids to solid supports. Factorial experimental design was used to systematically study the influence of variables such as lipid composition and substrate type on the adhesion. The firmness of adhesion was tested in the stripping test, where the deposited substrates were dipped through the lipid monolayer at the air-water interface, kept at a very low surface pressure. NTIS

N94-34120# Lawrence Livermore National Lab., CA.

RESONANT PHOTOEMISSION AND MAGNETIC X-RAY CIRCULAR DICHROISM IN THE M SHELL OF ULTRATHIN FILMS OF Fe

J. G. Tobin and G. D. Waddill 27 Sep. 1993 13 p Presented at the 38th Annual Conference on Magnetism and Magnetic Materials, Minneapolis, MN, 15-18 Nov. 1993

(Contract W-7405-eng-48)

(DE94-007453; UCRL-JC-114136; CONF-931133-8) Avail: CASI HC A03/MF A01

Using magnetic ultra thin films (2-4 ml) of Fe on Cu(001) and bulk-like Fe, the Fe3p and Fe3s core states have been investigated with resonant photoemission and core-level photoemission, including magnetic x-ray circular dichroism (MXCD) experiments. The resonant photoemission experiment has been done in fine steps over a wide photon energy range (h(nu) = 695 eV to 715 eV), to probe the parentage of various spectral structures. The onset of secondary channels at the L(sub 3)(h(nu) = 707 eV) and L(sub 2)(h(nu) = 72O eV) edges will be analyzed in light of results from bulk Ni. The MXCD photoelectron spectroscopy of the Fe3p exhibits a 0.2 eV shift with circular polarization variation. The previously observed split peak structure in the Fe3s are discussed with regard to the new resonant photoemission results. The resonant photoemission results will also be put into the context of our MXCD absorption results for monolayer and multilayers of Fe. DOE

N94-34133 Japan Thermal Spraying Society, Osaka (Japan).

PROCEEDINGS OF THE 57TH NATIONAL CONGRESS OF JAPAN THERMAL SPRAYING SOCIETY

19 May 1993 118 p In JAPANESE Meeting held in Osaka, Japan, 19-20 May 1993 Limited Reproducibility: More than 20% of this document may be affected by poor print and microfiche quality

(DE94-731734; CONF-9305316) Avail: Issuing Activity (Department of Energy (DOE))

The present proceedings includes two special presentation papers and 23 general presentation papers. The special presentations are 'Energy problems and thermal spraying' and 'Thermally sprayed coatings for high temperature environments'. The general presentations consist of five presentations on metal materials, such as TiC/TiAl composite layer, multicoated steel, Fe-C base alloy deposits, SUS440C/Ag composite coatings, and metal/ceramics mixed powders. Six presentations are on evaluation techniques of thermal spraying through the scanning vibrating electrode method and the thermal shock testing method. Six other presentations are on ceramic cermets, such as ZrO2-CeO2 base sprayed coatings, chromium oxide powder, WC-12%Co coating, and Ni/ZrO2 mechanically alloyed composite powders. Four of the presentations cover anticorrosion techniques by using the multilayer coating processing, anticorrosion metal spraying layer, and plasma sprayed coatings. Two presentations were about thermal spraying methods, such as high speed arc spray process and the TOP GUN spraying system. DOE

N94-34232*# Vanderbilt Univ., Nashville, TN. Dept. of Engineering and Applied Sciences.

SOLAR RADIATION EFFECTS ON GLASSES Final Report, 12 Apr. 1990 - 17 Jun. 1993

Donald L. Kinser 20 May 1994 2 p

(Grant NAG8-156)

(NASA-CR-195900; NAS 1.26:195900) Avail: CASI HC A01/MF A01

This work was begun in 1978 under NASA grant NAS8-32695 which prepared the samples that were included in the assemblage of samples on LDEF which was placed in earth orbit by Challenger crew members during mission 41C on April 1984. Those samples, recovered in February 1990, were exposed to earth orbit environment for a total of approximately 5.8 years. Following their recovery the optical and mechanical properties were characterized and sample surfaces were examined so as to characterize micrometeorite impact sites. Author (revised)

N94-34234*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

DAMAGE MECHANISMS AND CONTROLLED CRACK PROPAGATION IN A HOT PRESSED SILICON NITRIDE CERAMIC Ph.D. Thesis - Northwestern Univ., 1993

Anthony Martin Calomino May 1994 192 p

(RTOP 505-63-52)

(NASA-TM-106595; E-8867; NAS 1.15:106595) Avail: CASI HC A09/MF A02

The subcritical growth of cracks from pre-existing flaws in ceramics can severely affect the structural reliability of a material. The ability to directly observe subcritical crack growth and rigorously analyze its influence on fracture behavior is important for an accurate assessment of material performance. A Mode I fracture specimen and loading method has been developed which permits the observation of stable, subcritical crack extension in monolithic and toughened ceramics. The test specimen and procedure has demonstrated its ability to generate and stably propagate sharp, through-thickness cracks in brittle high modulus materials. Crack growth for an aluminum oxide ceramic was observed to be continuously stable throughout testing. Conversely, the fracture behavior of a silicon nitride ceramic exhibited crack growth as a series of subcritical extensions which are interrupted by dynamic propagation. Dynamic initiation and arrest fracture resistance measurements for the silicon nitride averaged 67 and 48 J/sq m, respectively. The dynamic initiation event was observed to be sudden and explosive. Increments of subcritical crack growth contributed to a 40 percent increase in fracture resistance before dynamic initiation. Subcritical crack growth visibly marked the fracture surface with an increase in surface roughness. Increments of subcritical crack growth loosen ceramic material near the fracture surface and the fracture debris is easily removed by a replication technique. Fracture debris is viewed as evidence that both crack bridging and subsurface microcracking may be some of the mechanisms contributing to the increase in fracture resistance. A Statistical Fracture Mechanics model specifically developed to address subcritical crack growth and fracture reliability is used together with a damaged zone of material at the crack tip to model experimental results. A Monte Carlo simulation of the actual experiments was used to establish a set of modeling input parameters. It was demonstrated that a single critical parameter does not characterize the conditions required for dynamic initiation. Experimental measurements for critical crack lengths, and the energy release rates exhibit significant scatter. The resulting output of the model produces good agreement with both the average values and scatter of experimental measurements. Author

N94-34278*# Arizona State Univ., Tempe, AZ. Dept. of Chemical, Bio and Materials Engineering.
COMPREHENSIVE INVESTIGATION OF HgCdTe METALORGANIC CHEMICAL VAPOR DEPOSITION Final Technical Report, 15 Mar. 1989 - 14 Mar. 1993
Gregory B. Raupp 1993 73 p
(Grant NAGw-1654)
(NASA-CR-195933; NAS 1.26:195933) Avail: CASI HC A04/MF A01

The principal objective of this experimental and theoretical research program was to explore the possibility of depositing high quality epitaxial CdTe and HgCdTe at very low pressures through metalorganic chemical vapor deposition (MOCVD). We explored two important aspects of this potential process: (1) the interaction of molecular flow transport and deposition in an MOCVD reactor with a commercial configuration, and (2) the kinetics of metal alkyl source gas adsorption, decomposition and desorption from the growing film surface using ultra high vacuum surface science reaction techniques. To explore the transport-reaction issue, we have developed a reaction engineering analysis of a multiple wafer-in-tube ultrahigh vacuum chemical vapor deposition (UHV/CVD) reactor which allows an estimate of wafer or substrate throughput for a reactor of fixed geometry and a given deposition chemistry with specified film thickness uniformity constraints. The model employs a description of ballistic transport and reaction based on the pseudo-steady approximation to the Boltzmann equation in the limit of pure molecular flow. The model representation takes the form of an integral equation for the flux of each reactant or intermediate species to the wafer surfaces. Expressions for the reactive sticking coefficients (RSC) for each species must be incorporated in the term which represents reemission from a wafer surface. The interactions of MOCVD precursors with Si and CdTe were investigated using temperature programmed desorption (TPD) in ultra high vacuum combined with Auger electron spectroscopy (AES). These studies revealed that diethyltellurium (DETe) and dimethylcadmium (DMCd) adsorb weakly on clean Si(100) and desorb upon heating without decomposing. These precursors adsorb both weakly and strongly on CdTe(111)A, with DMCd exhibiting the stronger interaction with the surface than DETe. Derived from text

N94-34285 Department of the Navy, Washington, DC.
POLYURETHANE SELF-PRIMING TOPCOATS Patent Application
Charles Hegedus, inventor (to Navy), Donald Hirst, inventor (to Navy), and Anthony Eng, inventor (to Navy) 25 Aug. 1992 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016160; US-Patent-Appl-SN-936983; US-Navy-Case-4078) Avail: CASI HC A03

A corrosion-resistant coating which can be applied directly to a surface as a self-priming topcoat comprising a polyurethane resin binder and a combination of pigments consisting essentially of a molybdate-modified zinc phosphate, zinc salts of benzoic acids, and an alkaline earth metal phosphate such as zinc-barium phosphate. In addition, the coating contains up to about 35 parts by weight of a titanium dioxide pigment, up to about 3.0 parts by weight of an oil soluble dispersant agent and up to about 50 parts by weight of at least one organic solvent. DTIC

N94-34388*# Alabama Univ., Huntsville, AL. Center for Automation and Robotics.
MATERIALS PROCESSING APPARATUS DEVELOPMENT FOR FLUORIDE GLASS Final Report
Guy A. Smith, Sue Kosten, and Gary L. Workman 31 Mar. 1994 26 p
(Contract NAS8-38609)
(NASA-CR-193963; NAS 1.26:193963) Avail: CASI HC A03/MF A01

Fluoride glasses have great potential for optical fiber communications due to the high transmittance when no microcrystallites occur during drawing operations. This work has developed apparatus to test the occurrence of microcrystallites during recrystallization in reduced gravity on the KC-135. The apparatus allows fluoride glass fiber, such as ZBLAN, to be melted and recrystallized during both the low and high g portions the parabolic flight. Author

N94-34403 Department of the Navy, Washington, DC.
SPIROBISLACTONE ACRYLATE POLYMERS Patent
Allison M. Sikes, inventor (to Navy) and Robert F. Brady, Jr., inventor (to Navy) 9 Nov. 1993 6 p Filed 25 Jun. 1992
(AD-D016190; US-Patent-5,260,414; US-Patent-Appl-SN-904096; US-Patent-Class-528-354) Avail: US Patent and Trademark Office

This invention is directed to a thermoplastic polymer that is solid at room temperature and which expands on further polymerization, to form a crosslinked polymer, and to a process for preparing the polymer and the crosslinked polymer. In a preferred embodiment the polymer is prepared by polymerizing 10-90 but preferably 20-80 mole percent of a lower alkyl acrylic monomer containing a spirobislactone moiety, 10-90 but preferably 20-80 mole percent of a lower alkyl acrylic monomer containing an epoxide moiety, and 0.1-5 but preferably 0.5-1 mole percent of a lower alkyl acrylic monomer containing a functional moiety chosen from primary amino, secondary amino, mercaptan, and hydroxyl groups which can initiate crosslinking with the spirobislactone moiety. The crosslinked polymer is devoid of a spirobislactone carbonyl absorption band and is insoluble in conventional organic solvents. DTIC

N94-34407 Department of the Navy, Washington, DC.
POLYMERS OF BIS (ETHYNYLSTYRYL) BENZENE AND RELATED MONOMERS Patent
Theordore R. Walton, inventor (to Navy) 23 Nov. 1993 6 p Filed 30 Jun. 1992
(AD-D016194; US-Patent-5,264,511; US-Patent-Appl-SN-906344; US-Patent-Class-526-285) Avail: US Patent and Trademark Office

Monomers, B-stage polymers, C-stage polymers, cured polymers and electrically conducting polymers of acetylene-terminated aromatic monomers containing three benzene rings separated by ethylene groups are disclosed. These new polymers can withstand aggressive environments and are particularly adapted for use in high temperature composites in addition to the utilization of their electrical conducting properties. Preparation of these materials is accomplished by melt polymerization and heat treatment at high temperatures. DTIC

N94-34601 Ohio State Univ., Columbus.
DEGRADATION OF RADIANT CERAMIC STRUCTURES IN COMBUSTION ATMOSPHERES Annual Report, Aug. 1992 - Jul. 1993
J. J. Lannutti and R. A. Rapp Jan. 1994 93 p See also PB93-158574 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract GRI-5091-260-2196)
(PB94-157849; GRI-93/0435) Avail: CASI HC A05

This work has been directed toward two distinct goals: applied burner R&D; and lifetime prediction for commercial radiant structures. The authors' modeling of radiant structures and their operational temperature profiles have been applied in the explanation of flashback and damage phenomena in a commercial radiant burner (Hi-Tech). The model description of the local pore environment was already validated as it accurately mimics the degradation characteristics of a pore in the Pyrocore burner. The monatomic hydrogen generator was used to demonstrate that the degradation characteristics of monatomic hydrogen are different from those of diatomic hydrogen. The thermodynamic characteristics of this form of degradation are important in providing information on the lifetime of radiant structures exposed to monatomic hydrogen at high temperatures. Finally, the microbalance work has identified resistant ceramics that are in the process of being incorporated into the Eclipse-Hi Tech burner. This project forms the basis for future technology transfer interactions between Ohio State University and radiant burner manufacturers. NTIS

N94-34682 Department of the Navy, Washington, DC.
POLYMER FROM DIIMIDO-DI-PHTHALONITRILE Patent
Teddy M. Keller, inventor (to Navy) 16 Nov. 1993 7 p Filed 12 Mar. 1992
(AD-D016189; US-Patent-5,262,514; US-Patent-Appl-SN-850370; US-Patent-Class-528-322) Avail: US Patent and Trademark Office

Substituted and unsubstituted di-phthalonitrile monomers devoid of ether and/or phenoxy groups are presented. The monomers are solid at room temperature. The monomers are defined by a general formula: where R is an aromatic tetravalent radical, thermoplastic prepolymers and thermosetting polymers which polymers are solid at room temperature and have a defined glass transition temperature if said polymers are cured at a temperature below a critical temperature or are devoid of a glass transition temperature

if said polymers are postcured at a temperature exceeding said critical temperature. DTIC

N94-34947*# Vanderbilt Univ., Nashville, TN. Dept. of Engineering and Applied Sciences.
MECHANICAL FAILURE PROBABILITY OF GLASSES IN EARTH ORBIT
Donald L. Kinser and David E. Wiedlocher 1992 17 p
(Contract NAS8-32695; NAG8-156; NASA Order L-17761-D)
(NASA-CR-195912; NAS 1.26:195912) Avail: CASI HC A03/MF A01

Results of five years of earth-orbital exposure on mechanical properties of glasses indicate that radiation effects on mechanical properties of glasses, for the glasses examined, are less than the probable error of measurement. During the 5 year exposure, seven micrometeorite or space debris impacts occurred on the samples examined. These impacts were located in locations which were not subjected to effective mechanical testing, hence limited information on their influence upon mechanical strength was obtained. Combination of these results with micrometeorite and space debris impact frequency obtained by other experiments permits estimates of the failure probability of glasses exposed to mechanical loading under earth-orbit conditions. This probabilistic failure prediction is described and illustrated with examples. Author (revised)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N94-33895# SRI International Corp., Menlo Park, CA. Molecular Physics Lab.
THEORETICAL STUDY OF NOVEL BONDING IN MOLECULES: METASTABLE MOLECULAR FUELS Interim Report, May 1990 - Jul. 1993
Roberta P. Saxon Mar. 1994 44 p
(Contract F04611-90-K-0201)
(AD-A277807; MP-93-154; PL-TR-93-3043; AD-E201836) Avail: CASI HC A03/MF A01

The goal of this program is to theoretically evaluate compounds comprised of first-row atoms that might serve as the basis of new propulsion schemes. This theoretical work is based on the premise that species which show promise as high energy density materials may exhibit novel bonding mechanisms which distinguish them from conventional stable molecules. Two, possibly overlapping, categories of species were considered: (1) electron deficient compounds, which are certain compounds of B and Be not having sufficient valence electrons to distribute two per chemical bond; and (2) mixed metal clusters of the form Li(n)B(m)H(k). A comprehensive study of the electron deficient compound BH4 as well as results for the mixed metal clusters Li3Be and Li3B is presented. In addition, results for the excited states and correlation diagram of BH2 obtained in support of the experimental program at Phillips Laboratory are detailed. Preliminary I(sp) estimates, used in program planning as well as calculations exploring the 'super alkali - super halogen' concept that was judged not to be promising are summarized. DTIC

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N94-33385# Applied Research Associates, Inc., Panama City, FL.
HALON 1211 REPLACEMENT AGENT EVALUATION-PERFLUOROHEXANE AND HALOTRON I Final Report
Michael A. Rochefort, Billy R. Dees, and Charles W. Risinger Nov. 1993 37 p
(Contract F08635-93-C-0020)
(AD-A278194; WL-TR-93-3520) Avail: CASI HC A03/MF A01

This test program quantified the fire extinguishment performance of the candidate Halon 1211 repiacement agents, perfluorohexane and Halotron I. Both of these agents were tested head-to-head with Halon 1211 for several typical aircraft fire scenarios. The following tests were conducted: agent throw-range tests, dry-pool fire extinguishment tests, three-dimensional inclined plane running fuel fire tests, simulated engine-nacelle running-fuel fire tests, and simulated wheel-well fires involving hydraulic fluid. All tests except the wheel well fire used JP-4 as the fuel. Amerex Model 600 (150-pound wheeled) extinguishers were used to dispense the agent in each test. DTIC

N94-33428 Universal Energy Systems, Inc., Dayton, OH. Materials Processing and Manufacturing Div.
INVESTIGATION OF MATERIALS PROCESSING TECHNOLOGY Final Report, 4 Apr. 1989 - 30 Dec. 1992
Douglas R. Barker, Venkat Seetharaman, and Robert Goetz Jul. 1993 155 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-89-C-5600)
(AD-A277588; WL-TR-93-4106) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report summarizes the work performed in materials processing research over the 45-month period from April 1989 through December 1992. The research work included projects on measuring the interface heat transfer coefficient in casting, predicting macro-segregation in casting, hot extrusion of TiAl alloy, canned extrusion of TiAl with core insulation, visioplasticity study of 6061 Al, cold rolling of Bi-based superconductor, and die design and process modeling of Mg+B4C alloy. The processing work in the Processing Laboratory included 2,357 extrusion, forging, rolling, vacuum arc melting, vacuum induction melting, and evacuation/outgas operations. The Processing Laboratory was also relocated as part of this program and the 700-ton Lombard extrusion press was completely rebuilt and modernized. DTIC

N94-33439 Naval Surface Warfare Center, Dahlgren, VA.
SYSTEMS DESIGN FACTORS: THE ESSENTIAL INGREDIENTS OF SYSTEM DESIGN, VERSION 0.4 Final Report
Cuong M. Nguyen and Steven L. Howell 18 Mar. 1994 101 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277702; NSWCDD/TR-92/268) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The key to designing a real-time, large, complex system is to optimize the design to meet the requirements and desired measure of effectiveness. In order to achieve this, the system engineer/analyst must have the capability to specify the design goals/criteria, to quantify various aspects of the design, and to perform trade-offs among different design goals. One of the mechanisms that provides these capabilities is the system design factors. Whether the system design emphasis is on real-time, largeness, complexity, parallelism, or any specific criteria, it requires a set of system design factors to describe the properties, attributes, and characteristics of the system. Each system design factor must have its own metric to gauge every detail of that system. The metric describes the weaknesses and strengths of a specific area in the design. In turn, the correlation of the system design factor characterizes the completeness and robustness of the system. Whether the system is designed top-down, bottom-up, or middle-out, the system design factors have major influence in design capture and analysis, design structuring decisions, allocation decisions, and trade-off decisions between various design structures and resource allocation candidates. DTIC

N94-33441 Texas Univ., Austin, TX. Bureau of Engineering Research.
SOLID FREEFORM FABRICATION SYMPOSIUM PROCEEDINGS
Harris L. Marcus, Joseph J. Beeman, Joel W. Barlow, David L. Bourell, and Richard H. Crawford Sep. 1993 395 p Symposium held in Austin, TX, 9-11 Aug. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0371)
(AD-A277718) Avail: CASI HC A17

This Proceedings of the Fourth Solid Freeform Fabrication Symposium, held at The University of Texas in Austin on August 9-11, 1993, reaffirms the dynamic nature of the research area. The interest shown by researchers over the wide range of disciplines and subdisciplines that make up solid freeform fabrication (SFF) highlight this technical symposium. The speakers

addressed problems in computer software, in machine design, materials synthesis and processing, and SFF in integrated manufacturing. The exponential growth in the research, application, and development of SFF approaches was readily apparent from the attendees from industrial users, SFF machine manufacturers, universities, and government. This symposium is the first where real progress toward structurally sound samples and parts was demonstrated as SFF moves from 'feelie' to 'nonstructural' to 'structural' real parts over a range of materials. This advancement in the state-of-the-art of SFF will continue to drive the exponential growth of the area. The excitement amongst the symposium participants will continue to serve as the catalyst for the continued growth and the availability of solid freeform fabrication. The symposium organizers look forward to its being a continued source of technical exchange among the growing body of researchers involved in SFF. DTIC

N94-33719*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
CREATIVE INVENTIVE DESIGN AND RESEARCH
James J. Kerley Jun. 1994 162 p
(RTOP 754-00-00)
(NASA-TM-104607; Rept-94B00088; NAS 1.15:104607) Avail: CASI HC A08/MF A02

This paper is a summary of a course given at the Goddard Space Flight Center for graduate engineers entitled 'Creative Inventive Design and Research.' This course strikes at the heart of the problem as it describes the thinking process itself before it goes deeper into the design process as a structured method for performing creative design. Many problem examples and figures are presented in a form that should make clear to all students what this process is and how it can be used. Author

N94-33950*# Little (Arthur D.), Inc., Cambridge, MA.
INVESTIGATION OF MOVING BELT RADIATOR TECHNOLOGY ISSUES Final Report
W. Peter Teagan and Jerry L. Aguilar Jun. 1994 180 p
(Contract NAS3-24650; RTOP 233-01-0D)
(NASA-CR-195340; E-8904; NAS 1.26:195340) Avail: CASI HC A09/MF A02

The development of an advanced spacecraft radiator technology is reported. The moving belt radiator is a thermal radiator concept with the promise of lower specific mass (per kW rejected) than that afforded by existing technologies. The results of a parametric study to estimate radiator mass for future space power systems is presented. It is shown that this technology can be scaled up to 200 MW for higher rejection temperatures. Several aspects of the design concept are discussed, including the dynamics of a large rotating belt in microgravity. The results of a computer code developed to model the belt dynamics are presented. A series of one-g experiments to investigate the dynamics of small belts is described. A comprehensive test program to investigate belt dynamics in microgravity aboard the NASA KC-135 aircraft is discussed. It was found that the desired circular shape can readily be achieved in microgravity. It is also shown that a rotating belt is stable when subjected to simulated attitude control maneuvers. Heat exchanger design is also investigated. Several sealing concepts were examined experimentally, and are discussed. Overall heat transfer coefficients to the rotating belt are presented. Material properties for various belt materials, including screen meshes, are also presented. The results presented in this report indicate that the moving belt radiator concept is technically feasible. Author

N94-34084# Donmar Ltd., Newport Beach, CA.
DEVELOPMENT OF A MACHINE VISION FIRE DETECTION SYSTEM Final Report, Aug. 1991 - Apr. 1993
A. D. Goedeke, G. Healey, and B. Drda Mar. 1994 81 p
(Contract F08635-91-C-0217)
(AD-A278208; WL-TR-93-3514) Avail: CASI HC A05/MF A01

This project resulted in the development, test, and delivery of a patented Machine Vision Fire Detector System (MVFDS) that provides for the first time a unique and reliable method of detecting fire events and determining their size, growth, distance, location, and overall threat in real-time. The system also provides simultaneous video coverage of the area being monitored by the MVFDS for fires. This 'man-in-the-loop' capability provides an option for manual override of automatic suppressant dump, or manual release of suppressant agent. The MVFDS is designed to be immune to false alarms based upon its decision process which involves identification, comparison, and deduction (emulates a human's process of deduction/decision) of unique properties of fire. These unique properties have been included into a fire model from which algorithms have been developed. The MVFDS uses a commercially available color CCD camera, frame grabber, microprocessor, video chip, and electronics. In aircraft hangar and facility applications, the detector is designed to identify a 2-foot x 2-foot fire at a distance of 100 feet in less than 0.5 seconds with no false alarms and, in other applications, detect fires in less than 30 milliseconds. DTIC

N94-34362# China Univ. of Mining and Technology.
A MICROCOMPUTER MEASURING-CONTROLLING SYSTEM FOR THE PERFORMANCE TEST OF FOGGING NOZZLES
Jun Cheng, Ming-Xing Ling, Ren-Zhi Wu, Qing Rui, and Yong-Zhong Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 244-248 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

32 COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

N94-33393 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
DIALOG STRUCTURE AND PLAN RECOGNITION IN SPONTANEOUS SPOKEN DIALOG
Sheryl R. Young Jun. 1993 14 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contracts N00014-93-1-2005; N00014-93-1-0806)
(AD-A277566; CMU-CS-93-199) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

In real spoken language applications, speakers interact spontaneously and frequently diverge from the task at hand by initiating various types of domain, application, or environmentally related subdialogs. We claim that unconstrained, task-oriented spontaneous spoken dialog is structured and predictable in spite of such phenomena as spurious topic changes and subdialogs. The discourse structure for any specific dialog is derived from the structure of the task, contextual constraints derived from prior interaction, and the characteristics of a finite set of discourse plans responsible for subdialogs and topic changes. This paper describes a preliminary model of discourse structure and plan recognition for spontaneous spoken discourse that has been implemented and evaluated on a 5000 utterance test corpora drawn from two distinct spoken language applications. The model dynamically constrains a speech recognizer, simplifies the process of inferring meaning from a spontaneous spoken utterance, and accounts for the subdialog phenomena observed. We describe these discourse plans, constraints on their occurrence and content, and their representation and processing. The model processes all subdialog phenomena using a domain plan tree, a current focus stack, and a set of domain tree traversal algorithms. DTIC

N94-33434# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE FOREST INVENTORY PROJECT AT THE TAPAJOS NATIONAL FOREST, VOLUME 1 Final Report [RELATORIO FINAL DO PROJETO DE INVENTARIO FLORESTAL NA FLONA DO TAPAJOS]
Pedro Hernandez Filho, Yosio Edemir Shimabukuro, David Chung Liang Lee, Celio PaivadosSantosFilho, and Rionaldo RolodeAlmeida Aug. 1993 127 p Prepared in cooperation with Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovave, Rio de Janeiro; Pro-Nature Foundation, Brazil; and International Tropical Timber Organization, Yamashito, Japan Original contains color illustrations
(INPE-5423-PRP/171) Avail: CASI HC A07/MF A02

A multistage sampling design for forest inventory was tested at the Tapajos Forest, located close to the city of Santarem, Para State, Brazil. This area has about 550,000 ha, covered by a dense tropical rainforest. Using the procedure of visual analysis of TM-Landsat images, five classes of forest were identified. The average and total volumes of timber for three forest classes were estimated. Furthermore, a data bank containing georeferenced data was set up, including thematic information such as vegetation, soils, geomorphology, drainage and topography, available to professionals of most different areas of human knowledge. Author

N94-33535*# Mississippi State Univ., Mississippi State, MS. Dept. of Electrical and Computer Engineering.

DATA COMMUNICATION NETWORK AT THE ASRM FACILITY Final Report No. 3, 6 Feb. 1993 - 5 Feb. 1994

Robert J. Moorhead, III, Wayne D. Smith, Ravi Nirgudkar, and James Dement 5 Feb. 1994 217 p

(Grant NAG8-866)

(NASA-CR-195901; NAS 1.26:195901) Avail: CASI HC A10/MF A03

This three-year project (February 1991 to February 1994) has involved analyzing and helping to design the communication network for the Advanced Solid Rocket Motor (ASRM) facility at Yellow Creek, near Iuka, MS. The principal concerns in the analysis were the bandwidth (both on average and in the worst case) and the expandability of the network. As the communication network was designed and modified, a careful evaluation of the bandwidth of the network, the capabilities of the protocol, and the requirements of the controllers and computers on the network was required. The overall network, which was heterogeneous in protocol and bandwidth, needed to be modeled, analyzed, and simulated to obtain some degree of confidence in its performance capabilities and in its performance under nominal and heavy loads. The results of our analysis did have an impact on the design and operation of the ASRM facility. During 1993 we analyzed many configurations of this basic network structure. The analyses are described in detail in Section 2 and 3 herein. Section 2 reports on an analysis of the whole network. The preliminary results of that research indicated that the most likely bottleneck as the network traffic increased would be the hubs. Thus a study of Cabletron hubs was initiated. The results of that study are in Section 3. Section 4 herein reports on the final network configuration analyzed. When the ASRM facility was mothballed in December of 1993, this was basically the planned and partially installed network. A briefing was held at NASA/MSFC on December 7, 1993, at which time our final analysis and conclusions were disseminated. This report contains a written record of most of the information disseminated at that briefing. Derived from text

N94-33547 Naval Undersea Warfare Center, Newport, RI.

ANTARCTIC METEOR SCATTER TEST, DECEMBER 1992 Final Report

B. L. Pease, P. E. Gilles, P. M. Mileski, and Joseph R. Katan 1 Feb. 1994 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(NR Proj. RC3-2-C)

(AD-A277894; NUWC-NPT-TR-10417) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report documents the 1992 Antarctic Meteor Scatter Test. The purpose of the test was to evaluate the performance of a meteor scatter communications link in high southern latitudes. DTIC

N94-33594 Texas A&M Univ., College Station, TX. Dept. of Electrical Engineering.

NONLOCAL METHODS FOR SIGNAL DETECTION AND ESTIMATION IN THE DEPENDENT NONSTATIONARY ENVIRONMENT Final Report, 1 Jul. 1991 - 30 Nov. 1993

Don Halverson 30 Nov. 1993 10 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Grant AF-AFOSR-0267-91)

(AD-A278472; AFOSR-94-0169TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

We have obtained a number of results pertaining to signal detection and estimation, where the underlying random processes are imperfectly known and often possess dependency and/or nonstationarity. Our results heavily emphasize nonlocal methods, that is, methods which allow an imperfectly known distribution to vary substantially and not simply be modeled as local to a nominal. Much of this work features robustness, but we also include research involving nonparametric algorithms. Our results include the design and analysis of the classically robust saddlepoint detector for nominally Laplace noise, development of quantitative nonlocal robustness measures for signal detection, parameter estimation, and the estimation of a random variable (all with dependent data), development of a 'user friendly' concept of average nonlocal robustness (a vast improvement over 'worst case' or 'least favorable' approaches), and an analysis of the stability of the false alarm rate of a classical 'nonparametric' detector (an analysis which uses nonlocal techniques). This work underscores that traditional algorithms, while useful, are limited by their design assumptions and can offer disappointing performance when presented with realistic data which reflects imperfectly known random processes possessing dependency and/or nonstationarity. Our quantitative results not only shed light on how bad the situation can be, but how to compensate for it with improved design procedures. DTIC

N94-33703 Northwest Research Associates, Inc., Bellevue, WA.

AN INVESTIGATION OF METHODS FOR IMPROVING MODELS OF IONOSPHERIC PLASMA-DENSITY IRREGULARITIES AND RADIO-FREQUENCY SCINTILLATION

James A. Secan and Robert M. Bussey 1 Nov. 1993 55 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F19628-91-C-0152)

(AD-A278568; NWRA-CR-93-R104; PL-TR-93-2260; AD-E201857; SR-2) Avail: CASI HC A04

Many modern military systems used for communications, command and control, navigation, and surveillance depend on reliable and relatively noise-free transmission of radiowave signals through the earth's ionosphere. Small-scale irregularities in the ionospheric density can cause severe distortion, known as radiowave scintillation, of both the amplitude and phase of these signals. The WBMOD computer program can be used to estimate these effects on a wide range of systems. The objective of this study is to investigate improvements to the WBMOD model based on extensive data sets covering both the equatorial and high-latitude regimes. This report summarizes the work completed during the second year, which include completion of the new models for the equatorial region and initial development of for the high latitude (auroral and polar cap) region. DTIC

N94-33710 Texas Technological Univ., Lubbock, TX. Dept. of Electrical Engineering.

ADAPTIVE ESTIMATION AND APPROXIMATION OF CONTINUOUSLY VARYING SPECTRAL DENSITY FUNCTIONS TO AIRBORNE RADAR Final Report, 15 Nov. 1991 - 14 Nov. 1993

Erol Emre 14 Nov. 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F49620-92-J-0044)

(AD-A277532; AFOSR-94-0090TR) Avail: CASI HC A03

The Target Reflectivity Frequency Response is estimated through an extension of the MUSIC-PISARENKO technique. Density function estimation will enable passive sensors to sort incoming angles and frequency. Time variation tracking is provided as an alternative to adaptive beam-forming. Noise is taken fully into consideration. Wavelet and Garbor filters were applied to range Doppler density evaluation. DTIC

N94-33756# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

DYADIC WAVELET FEATURES FOR ISOLATED WORD SPEAKER DEPENDENT SPEECH RECOGNITION M.S. Thesis

Stephen Ainge Mar. 1994 139 p

(AD-A278492; AFIT/GE/ENG/94M-03) Avail: CASI HC A07/MF A02

This research examines the use of dyadic wavelet features for the recognition of speaker dependent isolated word speech. The features were generated using three different wavelet filters: Daubechies 4 coefficient (Db4), Daubechies 20 coefficient (Db20), and a 31 coefficient cubic spline; and three different window lengths: 16 ms, 8 ms, and 4 ms. The accuracy of the standard and over-sampled dyadic wavelet methods were compared. The over-sampled dyadic wavelet method using the Db4 scaling function, with a maximum accuracy of 65.5%, was found to be the most accurate of the wavelet methods tested. The accuracy of this over-sampled dyadic Db4 wavelet method was compared to the accuracy of three Fourier feature

methods: octave frequency bandwidth, equal bandwidth, and Mel scaled bandwidth features. The dyadic wavelet methods did not perform as well as the Fourier methods. The maximum accuracy obtained for the wavelet methods was 65.5%, compared to the maximum accuracy of the octave bandwidth feature Fourier method of 85.6%. The combination of wavelet features and Fourier features was tested. The order of magnitude of the covariance matrices of each set were equalized and the resulting feature vector set classified. It was found that the recognition accuracy of the wavelet plus Fourier feature vectors, 74.0%, was lower than the recognition accuracy of the Fourier-only feature vectors, 84.5%. The inclusion of the wavelet features added information to the system that reduced the recognition effectiveness of the Fourier features. DTIC

N94-33768# Trident International, Inc., Orlando, FL.
HIGH DEFINITION TV PROJECTION VIA SINGLE CRYSTAL FACEPLATE TECHNOLOGY Final Report
H. J. Kindl and Thomas St.John 25 Mar. 1993 182 p
(Contract N61339-92-C-0014)
(AD-A277850) Avail: CASI HC A09/MF A02

Single crystal phosphor faceplates are epitaxial phosphors grown on crystalline substrates with the advantages of high light output, resolution, and extended operational life. Single crystal phosphor faceplate industrial technology in the United States is capable of providing a faceplate appropriate to the projection industry of up to four (4) inches in diameter. Projection systems incorporating cathode ray tubes utilizing single crystal phosphor faceplates will produce 1500 lumens of white light with 1000 lines of resolution, non-interlaced. This 1500 lumen projection system will meet all of the currently specified luminance and resolution requirements of Visual Display systems for flight simulators. Significant logistic advantages accrue from the introduction of single crystal phosphor faceplate CRT's. Specifically, the full performance life of a CRT is expected to increase by a factor of five (5); ie, from 2000 to 10,000 hours of operation. There will be attendant reductions in maintenance time, spare CRT requirements, system down time, etc. The increased brightness of the projection system will allow use of lower gain, lower cost simulator screen material. Further, picture performance characteristics will be more balanced across the full simulator. DTIC

N94-33778 Mitre Corp., Bedford, MA.
MEASURED CHANNEL PARAMETERS FOR THE DISTURBED WIDE-BANDWIDTH HF CHANNEL
Christopher A. Nissen and Phillip A. Bello Jan. 1994 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAAB07-93-C-H651)
(AD-A277877; MITRE-MP-94B0000006) Avail: CASI HC A03

Recent measurements have been made of the wideband HF (WBHF) channel impulse response over a high-latitude auroral path using the MITRE experimental WBHF test facility. A nominal instantaneous bandwidth of 1 MHz was used for the majority of the tests. These tests took place from 14 Mar. through 1 Apr. 1992 over a path from Sondrestrom AFB, Greenland to Bedford, Massachusetts, a distance of approximately 3100 km. The measurements were made using a direct-sequence pseudonoise (DSPN) channel probe with a chip rate of 1024 k samples per second. Channel impulse response samples at increments of 500 nanoseconds in delay were derived by correlating the received signal with a set of local DSPN references uniformly spaced in delay over a delay range of 2 ms. The channel was sampled in this fashion at a rate of up to 62.5 samples per second resulting in the ability to observe Doppler spreads and shifts of up to 31.25 Hz. From these measurements the channel scattering function, rms (2 sigma) Doppler spread, rms (2 sigma) Delay spread, Doppler shift, and rms (2 sigma) spread factor were calculated. In addition, for the first time, the impulse response correlation along the delay axis was calculated. These latter measurements support the use of an uncorrelated scattering hypothesis in modeling the disturbed WBHF channel. DTIC

N94-33780 Department of the Navy, Washington, DC.
RADIO WAVE REFRACTIVITY DEDUCED FROM LIDAR MEASUREMENTS Patent
Merle R. Paulson, inventor (to Navy) and Herbert G. Hughes, inventor (to Navy) 14 Dec. 1993 20 p Filed 31 Dec. 1990
(AD-D016147; US-Patent-5,270,929; US-Patent-Appl-SN-636512; US-Patent-Class-364-420) Avail: US Patent and Trademark Office

A high resolution lidar is used to backscatter light from atmospheric aerosols. The actual relative humidity is measured at altitudes corresponding to those from which the backscattered light occurs. A mathematical relationship between the two is then derived and this is used to predict atmospheric relative humidity from subsequent lidar backscatter's measurements. The predicted relative humidity is used with temperature and pressures derived from standard lapse rates to calculate the radio refractivity of the atmosphere. Radio ray coverage is then determined based upon the calculated radio refractivity. DTIC

N94-33833# Mitre Corp., Bedford, MA.
AN ADVANCED COMMUNICATIONS SYNTHESIZER
Ernst F. Scherer Feb. 1994 23 p
(Contract F19628-94-C-0001)
(AD-A277832; MTP-94B0000001) Avail: CASI HC A03/MF A01

With the proliferation of smaller and lower cost EHF terminals, the fast-hopping microwave synthesizer subsystem is rapidly becoming the limiting factor for further size and cost reduction. A new approach, based on a high-speed direct digital synthesizer (DDS) and a very fast voltage controlled oscillator (VCO) tracking loop, has yielded a highly integrable design with true low-cost potential. A frequency range of 1 to 20 GHz can be covered by a simple substitution of the VCO module. This advanced synthesizer realization promises a generic solution to a large class of synthesizer requirements, greatly facilitating standardization and promoting modular system concepts. DTIC

N94-33839# Los Alamos National Lab., NM.
BIAS-FIELD SCALING OF TERAHERTZ RADIATION FROM LARGE APERTURE PHOTOCONDUCTORS
T. J. Carrig, G. Rodriguez, and A. J. Taylor 1994 5 p Presented at the 9th International Conference on Ultrafast Phenomena, Dana Point, CA, 1-5 May 1994
(Contract W-7405-eng-36)
(DE94-007534; LA-UR-94-486; CONF-940593-3) Avail: CASI HC A01/MF A01

Measurements of terahertz radiation from photoconductors versus optical fluence and bias field are interpreted using a current surge model with a bias-field dependent mobility. DOE

N94-33840# Sandia National Labs., Albuquerque, NM.
THE TIME DOMAIN CROSSBAR (TDX): A HIGH SPEED, HIGH DENSITY, FPGA DESIGN
A. L. Schreiber 1993 6 p Presented at the Programable Logic Device Conference, San Jose, CA, 11-13 Apr. 1994
(Contract DE-AC04-94AL-85000)
(DE94-007862; SAND-93-2569C; CONF-9404119-2) Avail: CASI HC A02/MF A01

As system clock rates of electronic designs steadily increase, the need for high bandwidth communication between designs in the system becomes critical. The time domain crossbar (TDX) provides programmable, high-speed communications bandwidth across the user I/O pins of a VME backplane. The TDX time-multiplexes 20 MHz byte-wide data onto 80 MHz byte-wide data for transmission between boards. A programmable register set allows the user to open and close virtual communication channels by configuring independent data paths between sets of boards. Because each additional TDX board provides another crossbar, the overall system bandwidth increases with the number of TDX boards. DOE

N94-33847 Massachusetts Univ., Lowell, MA. Dept. of Physics.
BISTATIC CLUTTER RCS SIMULATION USING SCALE MODEL SURFACES WITH TWO SCALE ROUGHNESS Final Report, 1 Jun. 1992 - 31 Aug. 1993
Zoltan Fried 29 Oct. 1993 44 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0212)
(AD-A277604; AFOSR-94-0091TR) Avail: CASI HC A03

Bistatic scattering cross section measurements of CO2 laser radiation from slightly roughened metallic surfaces were made and compared to the predictions of the Rice theory. Co-pol and cross pol measurements were performed both in and out of the plane of incidence. The incident radiation

was linearly polarized in either the H or V configuration, perpendicular and parallel to the plane of incidence, respectively. For each state of incident polarization the scattered polarization was analyzed along two directions: perpendicular, (HH) and (HV), and parallel, (HV) and (VV), to the scattering plane. The Rice theory predicts the polarization dependent scattering cross section from a roughened surface with small scale roughness. Small scale roughness is defined in terms of h/lambda, where h is the rms value of the randomly distributed surface depths and lambda the wavelength of the incident radiation. A roughened surface with h/lambda less than 1/2(Pi) is considered to be small scale. The aluminum surfaces that were prepared for targets all satisfied the criteria for small scale roughness. The rms depth was obtained from specular reflection data which was fitted to the Davies formula, and the average slopes were obtained from profilometric traces. DTIC

N94-33848 State Univ. of New York, Binghamton, NY. Psychoacoustics and Auditory Cognition Lab.

PSYCHOPHYSICS OF COMPLEX AUDITORY AND SPEECH STIMULI Annual Report, 1 Nov. 1992 - 31 Oct. 1993

Richard E. Pastore 31 Oct. 1993 184 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F49620-93-1-0033)

(AD-A277605; AFOSR-94-0108TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A major focus on the primary project is the use of different procedures to provide converging evidence on the nature of perceptual spaces for speech categories. Completed research examined initial voiced consonants, with results providing strong evidence that different stimulus properties may cue a phoneme category in different vowel contexts. Thus, /b/ is cued by a rising second format (F2) with the vowel /a/, requiring both F2 and F3 to be rising with /i/, and is independent of the release burst for these vowels. Furthermore, cues for phonetic contrasts are not necessarily symmetric, and the strong dependence of prior speech research on classification procedures may have led to errors. Thus, the opposite (falling F2 and F3) transitions lead somewhat ambiguous percepts (i.e., not /b/) which may be labeled consistently (as /d/ or /g/), but requires a release burst to achieve high category quality and similarity to category exemplars. Ongoing research is examining cues in other vowel contexts and issuing procedures to evaluate the nature of interaction between cues for categories of both speech and music. DTIC

N94-33853 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.

LEARNING NEW WORDS FROM SPONTANEOUS SPEECH: A PROJECT SUMMARY

Sheryl R. Young Jul. 1993 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contracts N00014-93-1-2005; N00014-93-1-0806)

(AD-A277612; CMU-CS-93-223) Avail: CASI HC A03

This research develops methods that enable spoken language systems to detect and correct their own errors, automatically extending themselves to incorporate new words. The occurrence of unknown or out-of-vocabulary words is one of the major problems frustrating the use of automatic speech understanding systems in real world tasks. Novel words cause recognition errors and often result in recognition and understanding failures. Yet, they are common. Real system users speak in a spontaneous and relatively unconstrained fashion. They do not know what words the system can recognize and thereby are likely to exceed the system's coverage. Even if speakers constrained their speech, there would still be a need for self-extending systems as certain tasks inherently require dynamic vocabulary expansion (e.g. new company names, new flight destinations, etc.). Further, it is costly and labor intensive to collect enough training data to develop a representative vocabulary (lexicon) and language model for a spoken interface application. Unlike transcription tasks where it is often possible to find large amounts of on-line data from which a lexicon and language model can be developed, for many tasks this is not feasible. Developers of applications and database interfaces will probably not have the resources to gather a large corpus of examples to train a system to their specific task. Yet, most current speech and language model research is oriented toward training from large corpora. This research enables systems to be developed from small amounts of data and then 'bootstrapped'. DTIC

N94-33964 Army Communications-Electronics Command, Fort Monmouth, NJ.

THE COMMAND AND CONTROL REFERENCE MODEL FOR MODELING, SIMULATIONS, AND TECHNOLOGY APPLICATIONS

Israel Mayk 20 Jan. 1994 160 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A278300; CECOM-TR-94-1) Avail: CASI HC A08

The C2RM provides a framework for the evolution of a coordinated and detailed definition of a command and control (C2) discipline. The C2RM embodies an integrated multidisciplinary approach. It is intended to be complete and self-consistent for the main levels of abstractions encountered in models, simulations, operational applications, functional descriptions, paradigms and metaphors of C2. The scope of the C2RM embraces C2 using all key physical and logical interactions associated with C2 systems. It is concerned with interactions, involving not only communications (e.g., radios), but transportations (e.g., vehicles), identifications (e.g., sensors), and inflictions (e.g., weapons), which take place between resources of the same, friendly, hostile or neutral C2 units. High levels of abstractions of user requirements for C2 across the broad spectrum of military and civil domains have led to the development of the C2RM. It applies to all phases of system acquisition from the laboratory to the field and from conceptualization to realization. The C2RM is based upon generic and analog extensions to the International Standards Organization (ISO) open system interconnection (OSI) reference model (RM) which go far beyond the scope of the ISO OSI RM. The major theme, however, of layering services is preserved to facilitate understanding, reuse of design, implementation, and interoperability to the maximum degree possible with available C2 technology. DTIC

N94-34081 Ferdinand-Braun-Inst. fuer Hoechstfrequenztechnik, Berlin (Germany).

THE 2ND INTERNATIONAL WORKSHOP ON DISCRETE TIME DOMAIN MODELLING OF ELECTROMAGNETIC FIELDS AND NETWORKS

29 Oct. 1993 386 p Workshop held in Berlin, Germany, 28-29 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract DAJA45-93-M-0346)

(AD-A277551; R/D-7121-EE-03) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Due to advances in different areas of microwave and millimeter-wave techniques, demand for efficient CAD tools has grown. This statement is today as true as it was at our last workshop held two years ago in Munich on this topic. The numerical analysis in time domain is attractive since it describes the evolution of physical quantities in a natural way. The two basic concepts, the modelling of fields and networks, are more closely related than it seems at first glance. In the TLM method, for example, the network model is the basis for modelling electromagnetic fields. Another example is the application of generalized S-matrix methods and diacoptics in field theory. The purpose of this conference is to stimulate synoptic considerations of field theory and to promote a lively exchange between researchers engaged in these fields DTIC

N94-34096 National Defence Research Establishment, Stockholm (Sweden). Dept. of Information Technology.

NUMERICAL COMPUTATION AND MEASUREMENT OF RADAR CROSS SECTION FOR IMPULSE RADAR [NUMERISK BERAEKNING OCH MAETNING AV MALAREA FOER IMPULSRADAR]

L. Christerson Oct. 1993 62 p In SWEDISH

(PB94-149200; FOA-C-30732-2.3) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report investigates the applicability of a computer simulation package, GEMACS, for numerical computation of broadband electromagnetic scattering. Radar cross section (RCS) approximation for three dimensional objects by means of an integral equation approach using the method of moments is examined. RCS versus frequency, viewing angle, and polarization is obtained for finite cylinders and a sphere in the resonance region using two different solution methods. A surface patch model type employing the magnetic field integral equation and a wire grid type using the electric field integral equation are investigated. The surface patch model was found to be more versatile for broadband approximation of RCS since it provides better stability properties for the chosen segmentation than the wire grid model. The numerical results are compared with experimental data using

an impulse radar system for measurements in an anechoic chamber. The main area of application for the radar system is mine detection using the frequency band 0.2 - 2.0 GHz. Good agreement between computations and measurements is shown up to 1.2 GHz. A deconvolution method to improve experimental accuracy and thereby admit better estimation of the object's transfer function is discussed. NTIS

N94-34107 National Defence Research Establishment, Linkoeping (Sweden). Huvudavdelning foer Informationsteknologi.
IMPACT OF MULTIPATH ON MFSK. A COMPLEMENT TO FOA REPORT C 30671-3.5 [INVERKAN AV FLERVAEGSUTBREDNING PA MFSK. KOMPLEMENT TILL FOA RAPPORT C 30671-3.5]
G. Carlson Oct. 1993 25 p In SWEDISH See also PB93-162402 (PB94-149226; FOA-C-30733-3.5) Avail: Issuing Activity (National Technical Information Service (NTIS))

The orthogonal and noncoherently detected multiple frequency shift keying (MFSK) system is rigorously analyzed concerning bit error rate for arbitrary M on KV 90 channel models in contrast to the conservative simplification made in FOA report C 30671-3.5 (PB93-162402). Numerical results are given for M = 8. The rigorous analysis gives lower nonreducible error rates than the conservative simplification, at most a factor of 1/2 with a maximum around the delays specified by the KV 90 channel modes. The deviations are completely negligible for delays greater than half the symbol time. NTIS

N94-34109 National Defence Research Establishment, Linkoeping (Sweden). Huvudavdelning foer Informationsteknologi.
DETECTION OF POSSIBLE BURST TRANSMISSIONS IN A DENSE SIGNAL ENVIRONMENT [UPPTAECKT AV MOEJLIGA KORTTIDSSAENDNINGAR I EN TAET SIGNALMILJOE]
R. Gustavsson Dec. 1993 60 p In SWEDISH
(PB94-149259; FOA-C-30744-3.6) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report presents an algorithm for detection of possible narrowband burst transmissions in the HF band. The algorithm searches a time-frequency matrix containing 10 seconds of magnitude spectrums ranging over 250 kHz momentary bandwidth and is to be used as a preselection to an automatic classifier. The detection algorithm uses, among other things, a two dimensional convolution and analysis of the power spectrums of narrowband signals to extract continuous transmissions with durations of 0.5 to 4 seconds and bandwidths ranging from 100 to 3000 Hz. Initial tests using simulated burst transmissions indicate that the signal to interference ratio should be from 12 to 23 dB (depending on the duration of the burst transmission) to ensure a probability of detection of 50%. The frequency of alarms due to ordinary shortwave traffic is approximately one per second over 250 kHz momentary bandwidth. NTIS

N94-34162# Colorado School of Mines, Golden, CO. Center for Wave Phenomena.
BODY-WAVE RADIATION PATTERNS AND AVO IN TRANSVERSELY ISOTROPIC MEDIA
I. Tsvankin Mar. 1994 33 p
(Contract DE-FG02-89ER-14079)
(DE94-009214; DOE/ER-14079/31; CWP-144) Avail: CASI HC A03/MF A01

It is well known that the angular dependence of reflection coefficients may be significantly distorted in the presence of elastic anisotropy. However, the influence of anisotropy on amplitude-versus-offset analysis (AVO) is not limited to reflection coefficients. AVO signatures (e.g., AVO gradient) in anisotropic media are also distorted by the redistribution of energy along the wavefront of the wave travelling down to the reflector and back up to the surface. Significant anisotropy above the target horizon may be rather typical of sand-shale sequences commonly encountered in AVO analysis. Here, I examine the influence of P and S wave radiation patterns on AVO in the most common anisotropic model: transversely isotropic media. A concise analytic solution, obtained in the weak-anisotropy approximation, provides a convenient way to estimate the impact of the distortions of the radiation patterns on AVO results. It is shown that the shape of the P-wave radiation pattern in the range of angles most important to AVO analysis (0 to 40 degrees) is mostly dependent on the difference between Thomsen parameters epsilon and delta. For media with epsilon - delta greater than 0 (the most common case), the P-wave amplitude may drop substantially over the first 25 to 40 degrees from vertical. There is no simple correlation between the strength of velocity anisotropy and angular amplitude variations: for instance, for models with a fixed positive epsilon - delta the amplitude distortions are less pronounced for larger anisotropies epsilon and delta. The distortions of the SV-wave radiation pattern are usually much more significant than those for the P-wave. The anisotropic directivity factor for the incident wave may be of equal or greater importance for AVO than the influence of anisotropy on the reflection coefficient. DOE

N94-34280*# Alaska Univ., Fairbanks, AK. Geophysical Inst.
ANALYSIS OF DE-1 PWI ELECTRIC FIELD DATA Final Technical Report, 1 May 1993 - 1 May 1994
Daniel Weimer 1994 12 p Submitted for publication
(Grant NAG5-2249)
(NASA-CR-195950; NAS 1.26:195950) Avail: CASI HC A03/MF A01

The measurement of low frequency electric field oscillations may be accomplished with the Plasma Wave Instrument (PWI) on DE 1. Oscillations at a frequency around 1 Hz are below the range of the conventional plasma wave receivers, but they can be detected by using a special processing of the quasi-static electric field data. With this processing it is also possible to determine if the electric field oscillations are predominately parallel or perpendicular to the ambient magnetic field. The quasi-static electric field in the DE 1 spin/orbit plane is measured with a long-wire 'double probe'. This antenna is perpendicular to the satellite spin axis, which in turn is approximately perpendicular to the geomagnetic field in the polar magnetosphere. The electric field data are digitally sampled at a frequency of 16 Hz. The measured electric field signal, which has had phase reversals introduced by the rotating antenna, is multiplied by the sine of the rotation angle between the antenna and the magnetic field. This is called the 'perpendicular' signal. The measured time series is also multiplied with the cosine of the angle to produce a separate 'parallel' signal. These two separate time series are then processed to determine the frequency power spectrum. Derived from text

N94-34283 Department of the Navy, Washington, DC.
NONLINEAR FREQUENCY CONVERSION OPTICAL FILTER Patent Application
Bruce Boczar, inventor (to Navy) 20 Sep. 1993 17 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016127; US-Patent-Appl-SN-123959; Navy-Case-74269) Avail: CASI HC A03

The present invention is a method and system for performing optical filtering. Light energy in one frequency band is received in this system. The received light energy is filtered in one frequency band in order to provide filtered light which is applied to a nonlinear optical device. The nonlinear optical device provides frequency conversion preferably by forming a sum frequency or difference frequency. The frequency converted light energy is in a second frequency band. The energy in this second frequency band is applied to a further filter in a different frequency band wherein the two filter frequency bands are selected to prevent light energy from passing through both filters. The received light energy may contain information which is recoverable from the light energy which passes through the second filter. The nonlinear device is a crystal in which the index of refraction may be may be changed in order to tune the filter. DTIC

N94-34288 Illinois Inst. of Tech., Chicago, IL. Dept. of Electrical and Computer Engineering.
INVESTIGATION AND SIMULATION OF NONLINEAR PROCESSORS FOR SPREAD SPECTRUM RECEIVERS, VOLUME 1 Final Report, Feb. 1992 - Aug. 1993
Donald R. Ucci, William Jacklin, and Jimm Grimm Dec. 1993 249 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F30602-92-C-0039)
(AD-A278025; RL-TR-93-258-Vol-1) Avail: CASI HC A11

The objective of the recent research effort was to investigate and determine the viability of utilizing Locally Optimal (LO) nonlinear processing to mitigate non-Gaussian interfering signals in a Direct Sequence (DS) SS communications system. The effort centered on the use of memoryless techniques, as well as techniques employing memory, and performance

comparisons of many receiver and nonlinear processor configurations. The approach used included the analysis and evaluation of several implementation of the various nonlinear processing algorithms. The analysis included the study of well known techniques, as well as newly developed methods. Evaluation was accomplished through the development of software simulations designed to test the algorithms in various signaling scenarios. The results illustrate the tradeoffs of each nonlinear processor algorithm for use in a spread spectrum receiver. This knowledge can be used to determine the most effective processor for a given interference scenario. The work presented in this report is directly in line with the mission of Rome Laboratory (RL) to provide secure, reliable communications to the United States Air Force. DTIC

N94-34289# Illinois Inst. of Tech., Chicago, IL. Dept. of Electrical and Computer Engineering.

INVESTIGATION AND SIMULATION OF NONLINEAR PROCESSORS FOR SPREAD SPECTRUM RECEIVERS. VOLUME 2: USERS MANUAL Final Report, Feb. 1992 - Aug. 1993

Donald R. Ucci, William Jacklin, and Jimm Grimm Dec. 1993 143 p (Contract F30602-92-C-0039)

(AD-A278026; RL-TR-93-258-Vol-2) Avail: CASI HC A07/MF A02

The objective of the recent research effort was to investigate and determine the viability of utilizing Locally Optimal (LO) nonlinear processing to mitigate non-Gaussian interfering signals in a Direct Sequence (DS) SS communications system. The effort centered on the use of memoryless techniques, as well as techniques employing memory, and performance comparisons of many receiver and nonlinear processor configurations. The approach used included the analysis and evaluation of several implementation of the various nonlinear processing algorithms. The analysis included the study of well known techniques, as well as newly developed methods. Evaluation was accomplished through the development of software simulations designed to test the algorithms in various signaling scenarios. The results illustrate the tradeoffs of each nonlinear processor algorithm for use in a spread spectrum receiver. This knowledge can be used to determine the most effective processor for a given interference scenario. The work presented in this report is directly in line with the mission of Rome Laboratory (RL) to provide secure, reliable communications to the United States Air Force. DTIC

N94-34294 Research and Development Labs., Culver City, CA.

UNITED STATES AIR FORCE 1993 SUMMER RESEARCH PROGRAM. VOLUME 10: WRIGHT LABORATORY Final Research Report

1993 499 p Sponsored by AFOSR Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A278512) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The paper outlines two main tasks assigned during my employment as a graduate student research associate at the Wright Laboratory, Wright Paterson Air Force Base. Upon arrival at the Wright Laboratories, I was to investigate a method of signal processing, different from the common Fourier transform, in that inherent mathematical properties of the signal space were exploited in retrieving the spectrum of the signal. The two alternative signal processing methods investigated are the MUSIC and Minimum-Norm procedures for high resolution signal processing. The results of the investigation are included with a general comment section regarding the performance of the algorithms. The second main task assigned was the investigation of angle of arrival (AOA) calculation. Traditionally, methods such as beamforming have been used to estimate AOA using arrays of sensors and sophisticated signal processing algorithms. We are curious as to whether the AOA can be measured using only two sensors and FFT processing measuring of the phase difference of the signal at two adjacent sensors. Results of this study are presented with general comments as to the validity of the measuring paradigm. DTIC

N94-34302# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

COMPRESSION OF A RADAR TRACK OF A NEAR EARTH SATELLITE INTO AN EARTH CENTERED INERTIAL STATE VECTOR USING LEAST SQUARES DIFFERENTIAL CORRECTION M.S. Thesis

Garry L. Hall Mar. 1994 92 p

(AD-A278498; AFIT/GA/ENY/94M-1) Avail: CASI HC A05/MF A01

This study investigated the use of a least squares differential corrector to compress the information contained in a single radar track of a Near Earth satellite into a six element, Earth Centered Inertial state vector, and associated covariance matrix. Observations were generated using a truth model program based on two body, J2 geopotential, and atmospheric drag dynamics and consisted of simulated range, azimuth, and elevation. Random Gaussian noise was added to the data to simulate real world random errors. The orbital dynamics used in the estimator consisted of two body and J2 geopotential effects which were approximated using a Taylor Series expansion in time. Analysis was conducted using two circular, inclined low earth orbits. Estimator performance was evaluated as a function of maximum pass elevation, track duration, data rate, and the order of approximation of the equations of state. The estimator successfully extracted all of the pertinent information from the data with accuracy being dependent on the number of data points available. A correlation between the required order of approximation and maximum expected track length was also noted. DTIC

N94-34376# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research, Development, Technology and Evaluation Div.

RADAR DETECTION OF LOW-ALTITUDE TARGETS IN A MARITIME ENVIRONMENT. VOLUME 1: FINAL ANALYSIS Final Report

Kenneth D. Anderson Oct. 1993 73 p

(AD-A278493; NCCOSC/RDT/E-TR-1630-Vol-1) Avail: CASI HC A04/MF A01

Results from a unique analytical and measurement effort to assess low-altitude, short-range, radar detection capabilities in an evaporation ducting environment validate propagation model predictions of reduced radar detection ranges within the radio horizon. In addition, discrepancies between measured and predicted radar data demand a close examination of both meteorological data and surface layer theory. At ranges near and beyond the horizon, radar detection crucially depends both on the surface layer refractivity profile and on the adjacent mixed layer refractivity profile. A unified boundary layer model, an empirical model to merge the surface layer with the mixed layer, is described. Other discrepancies, which are thought to be caused either by inadequate surface layer modeling (perhaps the moisture stability function) or by inadequate boundary layer meteorological measurements, suggest the need for improvements in surface layer modeling and the need for new techniques to measure the refractivity structure. The combination of direct boundary layer (surface and mixed layer) meteorological measurements, remotely sensed radar measurements, and advanced numerical modeling capability provides valuable insight for a better understanding of the atmospheric boundary layer and its effects on the radar detection of low-altitude short-range targets. DTIC

N94-34378 Institute for Defense Analyses, Alexandria, VA.

A SURVEY OF FUZZY LOGIC AND APPLICATIONS Final Report, Feb. - Dec. 1993

Irvin W. Kay Jan. 1994 56 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A278524; IDA-D-1474; IDA/HQ-94-45020; AD-E501763) Avail: CASI HC A04

This document, prepared under IDA's Central Research Program, describes some proposed or implemented applications of the theory of fuzzy sets. It also attempts to characterize the nature of the applications that have been successful and to suggest how the methodology might be more effectively applied to certain proposed analytical applications. DTIC

N94-33617*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CALL SIGN INTELLIGIBILITY IMPROVEMENT USING A SPATIAL AUDITORY DISPLAY

Durand R. Begault *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 363-370 Sponsored in part by NASA. Kennedy Space Center (For primary document see N94-33612 10-99) Avail: CASI HC A02/MF A03

N94-33618*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.

LABORATORY AND IN-FLIGHT EXPERIMENTS TO EVALUATE 3-D AUDIO DISPLAY TECHNOLOGY

Mark Ericson, Richard McKinley, Marion Kibbe, and Daniel Francis *In*

NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 371-377 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N94-33375# Stanford Univ., CA.
LOW VOLTAGE ELECTRON BEAM LITHOGRAPHY Progress Report, Feb. - Mar. 1994
Aaron Baum and R. F. Pease Mar. 1994 3 p
(Contract N00014-92-J-1996)
(AD-A278204) Avail: CASI HC A01/MF A01

In order to measure the energy spread of electrons emitted from various negative electron affinity cathode structures, a simple apparatus using a uniform retarding field inside night vision tubes and customized tubes (all made by Intevac) was constructed and initial measurements performed. GaAs and GaAsP photocathodes with CsO activations were measured. Energy spreads as low as 100meV were observed from a low quantum efficiency GaAs cathode. An extremely sharp (30meV width) vacuum-level cutoff in the energy distribution from the GaAsP was observed. These two results show both the possible energy resolution of the technique and the energy spreads achievable from negative electron affinity photocathodes. Energy distribution variation indicated the importance of scattering in the band-bending region, and thus suggested the possibility of heterostructure and doping variation at the surface to minimize the energy spread. A design for an optimum cathode was developed. DTIC

N94-33376 Reliability Analysis Center, Griffiss AFB, NY.
WORST CASE CIRCUIT ANALYSIS APPLICATION GUIDELINES
1993 97 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F30602-91-C-0002)
(AD-A278216) Avail: CASI HC A05

This document presents an overview of Worst Case Circuit Analysis. Worst Case Circuit Analysis is a method for determining circuit performance under extreme (worst case) conditions. This process is accomplished by analyzing a circuit's variability with respect to part parameter tolerance extremes. Part parameter variation is the result of both internal and external factors. This document also presents general guidelines for implementing and performing a worst case circuit analysis. DTIC

N94-33386# Princeton Univ., NJ. Dept. of Electrical Engineering and Computer Science.
PHOTONIC FAST PACKET SWITCHING USING OPTICALLY PROCESSED CONTROL Final Report, Jul. 1992 - Jul. 1993
Paul R. Prucnal Mar. 1994 35 p
(Contract F30602-92-C-0040; AF Proj. 4600)
(AD-A278195; RL-TR-94-9) Avail: CASI HC A03/MF A01

In this research program, we have studied architectural and performance modeling issues which are central to the development of high-speed optical networks. We have focussed primarily on the architecture of a broadband photonic packet switch. The use of optical processing to perform switch routing functions permits real-time routing of packets at high speed. The architecture of a 2x2 photonic packet switching node using optically-processed fixed-directory routing, contention resolution (using deflection routing), and synchronization was investigated, and is presented in detail in this final report. Deflection routing is well-suited for contention resolution using processing technologies in which buffers are expensive or not available, as is presently the case with optical technology. Simplified optically-processed self-routing procedures are found for banyan (baseline, shuffle-exchange and crossover) and lattice networks. Although lattice networks require a larger number of switching elements than banyan networks, they have a simpler interconnection field, and unlike banyan networks, the self-routing rule for lattices can avoid any internal blocking. DTIC

N94-33398# Trident International, Inc., Orlando, FL.
DISPLAY PROJECTOR TECHNOLOGY BY WAY OF SINGLE CRYSTAL FACEPLATE TECHNOLOGY Final Report, Nov. 1990 - Aug. 1993
A. Tucker and H. J. Kindl 29 Sep. 1993 96 p
(Contract N61339-91-C-0052)
(AD-A277800) Avail: CASI HC A05/MF A01

Three single crystal faceplates were to be integrated into Cathode Ray Tube (CRT) envelopes with the intent of evaluating the light output from Ce:YAG (Green), modified Ce:GD, YAG (Orange), and CE:BEL (Blue). These CRT's were to be mounted in the projection test bed developed under Contract N61339-90-C-0047 and furnished G.F.P. to Trident International, Inc. for use and delivery during this contract. Three 3 inch diameter Ce:YAG faceplates were supplied as G.F.P. from the previous contract N61339-90-C-0047. One of these three was to be used for construction of a CRT, the remaining two were to be used for the coating test. During the processing of the CRT's, one of the crystals was destroyed. The other two single crystal faceplates were incorporated in test CRT's. An additional Ce:Gd, YAG (Red shifted green) faceplate of 1.5 inches diameter and two Ce:BEL (Blue) crystals of 0.75 inch diameter were obtained from Allied Signal, Inc, by Trident. Investigations were made to provide optimum optical coupling of the CRT light output into a projection lens. Index matching heat dissipation fluids were used. A wide angle lens was selected and supplied by the contractor. Filtering of the light output of the Ce:YAG, Ce:Gd, YAG and Ce:BEL faceplates was investigated for use in producing green, red, and blue light outputs suitable for a full color video projector. DTIC

N94-33399 Trident International, Inc., Orlando, FL.
SINGLE CRYSTAL FACEPLATE EVALUATION Final Report, Nov. 1990 - Oct. 1993
A. R. Tucker and H. J. Kindl 25 Oct. 1993 175 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N61339-90-C-0047)
(AD-A277922) Avail: CASI HC A08

The Naval Training Systems Center developed single crystal faceplates which held promise for providing a significantly improved life span over conventional power phosphor cathode ray tubes (CRT) while maintaining acceptable resolution and light output characteristics. Single crystal faceplates being evaluated are composed of yttrium aluminum garnet (YAG) with an epitaxial cerium phosphor layer grown on the YAG substrate producing a cathodoluminescent material (CE:YAG). The single crystal nature of these faceplates should allow higher resolution (no phosphor grains) and higher thermal conductivity. DTIC

N94-33583* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SPACE ELECTRONICS VIDEO: RESEARCH FOR TODAY AND TOMORROW (Videotape)
1991 Videotape: 7 min. 15 sec. playing time, in color, with sound
(NASA-TM-109829; NONP-VT-94-12957) Avail: CASI VHS A01/BETA A22

This video gives an overview of work being done by the different branches of the Space Electronics Division at LeRC. The video highlights electron beam, solid state, high speed circuit design and, high frequency communication research. CASI

N94-33588 Magnascreen Corp., Horsham, PA.
DEVELOPMENT OF LARGE AREA, TILED, LIQUID CRYSTAL DISPLAY Final Report, Feb. 1992 - Dec. 1993
N. Mazurek and T. J. Zammit Dec. 1993 81 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-92-C-3806)
(AD-A277564; WL-TR-93-1164) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This document presents the results of the development of a large area, tiled, liquid crystal display system that is seamless in appearance. Magnascreen demonstrated the feasibility of using an array of smaller, cost effective LCDs to create a large display seamless in appearance. The

vehicle chosen for demonstrating the system was a 1.3 m VGA monitor design. A 3 x 2 array was fabricated to verify the system design concept. DTIC

N94-33611*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HIGH EFFICIENCY InP SOLAR CELLS FROM LOW TOXICITY TERTIARYBUTYLPHOSPHINE
Richard W. Hoffman, Jr. (Analex Corp., Brook Park, OH.), Navid S. Fatemi (NYMA, Inc., Brook Park, OH.), David M. Wilt, Phillip P. Jenkins, David J. Brinker, and David A. Scheiman May 1994 11 p
(Contracts NAS3-25776; NAS3-27186; RTOP 233-01-0A)
(NASA-TM-106598; E-8872; NAS 1.15:106598) Avail: CASI HC A03/MF A01

Large scale manufacture of phosphide based semiconductor devices by organo-metallic vapor phase epitaxy (OMVPE) typically requires the use of highly toxic phosphine. Advancements in phosphine substitutes have identified tertiarybutylphosphine (TBP) as an excellent precursor for OMVPE of InP. High quality undoped and doped InP films were grown using TBP and trimethylindium. Impurity doped InP films were achieved utilizing diethylzinc and silane for p and n type respectively. 16 percent efficient solar cells under air mass zero, one sun intensity were demonstrated with Voc of 871 mV and fill factor of 82.6 percent. It was shown that TBP could replace phosphine, without adversely affecting device quality, in OMVPE deposition of InP thus significantly reducing toxic gas exposure risk. Author

N94-33723 Department of the Navy, Washington, DC.
MICROELECTRONIC PHOTOMULTIPLIER DEVICE WITH INTEGRATED CIRCUITRY Patent
Randy L. Shimabukuro, inventor (to Navy) and Stephen D. Russell, inventor (to Navy) 23 Nov. 1993 12 p Filed 1 Jul. 1992
(AD-D016176; US-Patent-5,264,693; US-Patent-Appl-SN-908692;
US-Patent-Class-250-207) Avail: US Patent and Trademark Office

A microelectronic photomultiplier device is fabricated by discrete procedures to provide a photocathode-anode and dynode chain arrangement which is analogous in operation to conventional photomultiplier tubes. This microelectronic photomultiplier device provides for low level photon detection and realizes the advantages of high reliability, small size and fast response, plus lower cost, weight and power consumption compared to conventional photomultiplier tubes. In addition, the fabrication on an SOI substrate permits integration of logic and control circuitry with detectors. The insulating substrate also permits the integration of an on-chip high voltage supply and may easily be extended to a plurality of detectors offering improved performance and design flexibility. DTIC

N94-33732# Oak Ridge National Lab., TN.
EFFICIENCY CONSIDERATION OF DC LINK SOFT-SWITCHING INVERTERS FOR MOTOR DRIVE APPLICATIONS
J. S. Lai, R. W. Young, and J. W. McKeever 1994 10 p Presented at the IEEE Power Electronics Specialists Conference, Taipei, China, 20-24 Jun. 1994
(Contract DE-AC05-84OR-21400)
(DE94-003604; CONF-940673-1) Avail: CASI HC A02/MF A01

?his paper critically evaluates efficiency of soft switching inverters including an actively clamped resonant DC link inverter and a clamped-mode resonant pole inverter. An analytical approach to evaluating efficiency of the clamped-mode soft switching inverter has been developed. The evaluation results are compared with that of the standard pulse-width-modulation (PWM) inverter. A 50-kW induction motor is used as the variable load, and the inverter efficiency is evaluated under different speed and torque conditions. The clamped-mode soft-switching inverter, although eliminating the switching loss, shows poor efficiency over the entire load range. Under low load conditions, the efficiency profile is even worse. The actively clamped resonant DC link inverter shows highest efficiency over the entire speed and torque range. However, its energy saving over the standard PWM inverter is marginal under full load or high speed conditions. DOE

N94-33735# Sandia National Labs., Albuquerque, NM.
ASSESSMENT OF THE CURRENT EUROPEAN RESEARCH AND DEVELOPMENTS IN NON-INVASIVE INTEGRATED CIRCUIT ANALYSIS
A. N. Campbell 24 Nov. 1993 14 p
(Contract DE-AC04-94AL-85000)
(DE94-004042; DOE/FTR-94004042) Avail: CASI HC A03/MF A01 (US Sales Only)

The purpose of this trip was to develop an understanding and assessment of the current European research and development in non-invasive integrated circuit (IC) analysis. This was achieved by attending the 4th European Conference on Electron and Optical Beam Testing of Electronic Devices (EOBT 93) and by visiting selected European research organizations. DOE

N94-33759 Department of the Navy, Washington, DC.
TURN-ON TRANSIENT OVERCURRENT RESPONSE SUPPRESSOR Patent
Thomas I. Kirkpatrick, inventor (to Navy) 26 Oct. 1993 5 p Filed 18 Mar. 1992
(AD-D016151; US-Patent-5,257,156; US-Patent-Appl-SN-855362;
US-Patent-Class-361-18) Avail: US Patent and Trademark Office

A turn-on transient overcurrent response suppressor is connected to an existing electrical circuit having a regulator circuit that includes an overcurrent protection mechanism. A first charging circuit is connected to the power supply for simultaneous charging therewith. A second charging circuit is connected to the first charging circuit for delayed charging therewith. Connected between the first and second charging circuits is a circuit to create a low impedance discharge path for the second charging circuit while preventing discharge of the first charging circuit when the power supply is no longer providing the input voltage. First and second transistor circuits are connected to turn on during the charging and discharging of the second charging circuit and turn off when the second charging circuit is fully charged. In this way, turn-on transients caused by loss of AC power are prevented from falsely triggering the regulator circuit's overcurrent protection mechanism. The suppressor is particularly useful when a driven load is an active device. DTIC

N94-33766 Department of the Navy, Washington, DC.
LOW LEVEL SERIAL TRANSCEIVER Patent
Trung H. Tran, inventor (to Navy) 21 Dec. 1993 6 p Filed 26 Apr. 1991
(AD-D016166; US-Patent-5,272,722; US-Patent-Appl-SN-695039;
US-Patent-Class-375-7) Avail: US Patent and Trademark Office

A transceiver has a transmitter portion using serially coupled FETs coupled to low level positive and negative bias sources to enable a low power drain conversion of TTL input signals to low level serial data output signals for a coaxial data transmission cable and vice versa. The transceiver also provides a constant 50 ohm impedance for the coaxial or triaxial transmission cable during active transmission periods, stand-by periods and power-off periods to provide an inexpensive method to transmit and receive 10 megabit coded data via a coaxial or triaxial cable. DTIC

N94-33837 Department of the Navy, Washington, DC.
MULTIFILAMENTARY SUPERCONDUCTING CABLE AND A METHOD OF MANUFACTURING IT Patent
William A. Ferrando, inventor (to Navy), Amarnath P. Divecha, inventor (to Navy), and James Kerr, inventor (to Navy) 16 Nov. 1993 4 p Filed 17 Jul. 1992
(AD-D016146; US-Patent-5,261,151; US-Patent-Appl-SN-914669;
US-Patent-Class-24-599) Avail: US Patent and Trademark Office

A Nb-Ti or Nb-Zr low temperature superconducting (LTS) wire is coated with molten AgNO3 which is then decomposed to form a uniform silver metal (Ag) coating on the LTS wire. A uniform coating of molten Al or Al alloy is formed on the Ag coated LTS wire and then solidified. A bundle of the coated LTS wires is inserted into an Al or Al alloy tube and cold worked to form a multifilamentary LTS cable comprising the Ag coated LTS wires each surrounded by an Al or Al alloy matrix. Author (DTIC)

N94-33842# Lawrence Livermore National Lab., CA.
FIBER OPTIC TRANSCEIVER FOR INTERFACING DIGITAL SUPERCONDUCTING ELECTRONICS
K. McCammon, J. Morse, D. Masquelier, C. McConaghey, H. Garrett, K. Hugenberg, M. Lowry, E. Track, and L. Bunz Mar. 1994 9 p Presented at the DOD Fiber Optics 1994 Conference, McLean, VA, 22-24 Mar. 1994

(Contract W-7405-eng-48)
(DE94-008284; UCRL-JC-115712; CONF-940363-4) Avail: CASI HC A02/MF A01

Low temperature experiments have been conducted in order to characterize the performance of high speed photodetectors and LiNbO3 optical modulators in cryogenic environments down to 4.2 K. Specific parameters quantified from this study include bandwidth, responsivity, V(sub pi) (half wave voltage), optical loss, and package stability. Metal-semiconductor-metal (MSM) photodiodes fabricated from GaAs and InGaAs have been characterized. Results demonstrate that both the responsivity and bandwidth depend on temperature. Several Mach-Zehnder (MZ) modulator designs were tested over the dc to greater than 20 GHz range. These results demonstrate the performance of LiNbO3 modulators at cryogenic temperatures and enable the design of high sensitivity data links. The experimental results are coupled with optical data link analysis to estimate the performance of transmit and receive modules in cryogenic systems. This further provides insight into the critical issues associated with the integration of optoelectronic networks with superconducting signal processing circuits. DOE

N94-33854 Vanderbilt Univ., Nashville, TN. Learning Technology Center.
ASSESSING DESIGN ACTIVITY IN COMPLEX CMOS CIRCUIT DESIGN Technical Report, May 1991 - 31 Dec. 1993
Gautam Biswas, Susan R. Goldman, Doug Fisher, Bharat Bhuva, and Grant Glewwe 1 Mar. 1994 43 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-91-J-1680)
(AD-A277620; Rept-94-2) Avail: CASI HC A03

This chapter characterizes human problem solving in digital circuit design. We analyze protocols of designers with varying degrees of training, identifying problem solving strategies used by these designers, discuss activity patterns that differentiate designers, and propose these as a tentative basis for assessing expertise in digital design. Throughout, we argue that a comprehensive model of human design should integrate a variety of strategies, which heretofore have been proposed as individually sufficient models of human design problem solving. We close by describing an automated tool for design and its assessment. DTIC

N94-33861# California Univ., Davis, CA.
DIELECTRIC LOADED BROADBAND GYRO-TWT SYSTEM Final Report, 1 Jan. 1992 - 31 Dec. 1993
N. C. Luhmann, Jr. 31 Dec. 1993 12 p
(Contract F49620-92-J-0175)
(AD-A277889; AFOSR-94-0136TR) Avail: CASI HC A03/MF A01

Basic research studies on the generation of high frequency waves at high power are presented. The studies were carried out in the hope of learning how to minimize problematic technological requirements such as high voltage and intense magnetic fields. DTIC

N94-33893 Westinghouse Science and Technology Center, Pittsburgh, PA.
PROCESSING, FABRICATION, AND DEMONSTRATION OF HTS INTEGRATED MICROWAVE CIRCUITS Research and Development Status Report, 25 Oct. 1993 - 30 Jan. 1994
G. R. Wagner 30 Jan. 1994 38 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-91-C-0112)
(AD-A277684) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

An analysis was carried out to determine the effect of HTS preselector filters on the sensitivity and spur-free dynamic range of a microwave receiver. The study is based on the measurements presented in our quarterly report and on intermodulation distortion and noise figures in HTS filters. A result of the analysis is that the low noise figure of HTS filters will allow the benefits of preselection without significantly contributing to the system noise figure. In addition, the intermodulation distortion measured so far in HTS filters was found to be low enough not to affect the system spur-free dynamic range, which is generally set by the other nonlinear components in the system. DTIC

N94-33921# Naval Postgraduate School, Monterey, CA.
A CMOS VLSI IC FOR REAL-TIME OPTO-ELECTRONIC TWO-DIMENSIONAL HISTOGRAM GENERATION Ph.D. Thesis
James K. Richstein Dec. 1993 93 p
(AD-A277910) Avail: CASI HC A05/MF A01

Histogram generation, a standard image processing operation, is a record of the intensity distribution in the image. Histogram generation has straightforward implementations on digital computers using high level languages. A prototype of an optical-electronic histogram generator was designed and tested for 1-D objects using wirewrapped MSI TTL components. The system has shown to be fairly modular in design. The aspects of the extension to two dimensions and the VLSI implementation of this design are discussed. In this paper, we report a VLSI design to be used in a two-dimensional real-time histogram generation scheme. The overall system design is such that the electronic signal obtained from the optically scanned two-dimensional semi-opaque image is processed and displayed within a period of one cycle of the scanning process. Specifically, in the VLSI implementation of the two-dimensional histogram generator, modifications were made to the original design. For the two-dimensional application, the output controller was analyzed as a finite state machine. The process used to describe the required timing signals and translate them to a VLSI finite state machine using Computer Aided Design Tools is discussed. In addition, the circuitry for sampling, binning, and display were combined with the timing circuitry on one IC. In the original design, the pulse width of the electronically sampled photodetector is limited with an analog one-shot. The high sampling rates associated with the extension to two dimensions requires significant reduction in the original 1-D prototype's sample pulse width of approximately 75 ns. The alternate design using VLSI logic gates will provide one-shot pulse widths of approximately 3 ns. DTIC

N94-33927# Sandia National Labs., Albuquerque, NM.
WAFER-LEVEL PULSED-DC ELECTROMIGRATION RESPONSE AT VERY HIGH FREQUENCIES
D. G. Pierce, E. S. Snyder, S. E. Swanson, and L. W. Irwin 1994 9 p Presented at the International Reliability Physics Symposium, San Jose, CA, 11-14 Apr. 1994
(Contract DE-AC04-94AL-85000)
(DE94-008455; SAND-94-0483C; CONF-940453-4) Avail: CASI HC A02/MF A01

DC and pulsed-DC electromigration tests were performed at the Wafer-Level Pulsed-DC Electromigration Response and pulsed-DC electromigration tests were performed at the wafer level using standard and self-stressing test structures. DC characterization tests over a very large temperature range (180 to 560 C) were consistent with an interface diffusion mechanism in parallel with lattice diffusion. That data allowed for extraction of the respective activation energies and the diffusion coefficient of the rapid mechanism. The ability to extract simultaneously a defect-based diffusion coefficient and activation energy is significant given the extreme difficulty in making those measurements in aluminum. The pulsed-DC experiments were conducted over a range that includes the highest frequency to date, from DC to 500 MHz. Measurements were also made as a function of duty factor from 15% to 100% at selected frequencies. The data shows that the pulsed-DC lifetime is consistent with the average current density model at high (greater than 10 MHz) frequencies and showed no additional effects at the highest frequency tested (500 MHz). At low frequencies, we attribute the lessened enhancement to thermal effects rather than vacancy relaxation effects. Finally, the deviation in lifetime from the expected current density dependence, characterized over 1 and 1/2 orders of magnitude in current density, is explained in terms of a shift in the boundary condition for electromigration as the current density is decreased. DOE

N94-33928# Stanford Research Inst., Menlo Park, CA. Linear Accelerator Center.
AN ANALOG MEMORY INTEGRATED CIRCUIT FOR WAVEFORM ACQUISITION UP TO 900 MHz
G. M. Haller and B. A. Wooley Dec. 1993 5 p Presented at the 1993 IEEE Nuclear Science Symposium and Medical Imaging Conference, San Francisco, CA, 2-5 Nov. 1993
(Contract DE-AC03-76SF-00515)
(DE94-009020; SU-SLAC-PUB-6402; CONF-931107-36) Avail: CASI HC A01/MF A01

The design and implementation of a switched-capacitor memory suitable for capturing high-speed analog waveforms is described. Highlights of the presented circuit are a 900 MHz sampling frequency (generated on chip), input signal independent cell pedestals and sampling instances, and cell gains that are insensitive to component sizes. A two-channel version of the memory with 32 cells for each channel has been integrated in a 2-micron complementary metal oxide semiconductor (CMOS) process with poly-to-poly capacitors. The measured rms cel pedestal variation in a channel after baseline subtraction is less than 0.3 mV across the full input signal range. The cell-to-cell gain matching is better than 0.01% rms, and the nonlinearity is less than 0.03% for a 2.5-V input range. The dynamic range of the memory exceeds 13 bits, and the peak signal-to-(noise+distortion) ratio for a 21.4 MHz sine wave sampled at 900 MHz is 59 dB. DOE

N94-33937# Brookhaven National Lab., Upton, NY.
INTEGRAL TESTING OF RELAYS AND CIRCUIT BREAKERS
K. K. Bandyopadhyay 1993 11 p Presented at the Water Reactor Safety Information Meeting, Bethesda, MD, 25-27 Oct. 1993
(Contract DE-AC02-76CH-00016)
(DE94-009075; BNL-NUREG-60202; CONF-931079-25) Avail: CASI HC A03/MF A01

Among all equipment types considered for seismic qualification, relays have been most extensively studied through testing due to a wide variation of their designs and seismic capacities. A temporary electrical discontinuity or 'chatter' is the common concern for relays. A chatter duration of 2 milliseconds is typically used as an acceptance criterion to determine the seismic capability of a relay. Many electrical devices, on the other hand, receiving input signals from relays can safely tolerate a chatter level much greater than 2 ms. In phase 1 of a test program, Brookhaven National Laboratory performed testing of many relay models using the 2-ms chatter criterion. In phase 2 of the program, the factors influencing the relay chatter criterion and impacts of relay chatter on medium and low voltage circuit breakers and lockout relays were investigated. This paper briefly describes the phase 2 tests and presents the important observations. DOE

N94-33944*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THEORETICAL, EXPERIMENTAL, AND COMPUTATIONAL EVALUATION OF DISK-LOADED CIRCULAR WAVE GUIDES
Thomas M. Wallett and A. Haq Qureshi Jun. 1994 23 p
(RTOP 235-01-1C)
(NASA-TM-106640; E-8944; NAS 1.15:106640) Avail: CASI HC A03/MF A01

A disk-loaded circular wave guide structure and test fixture were fabricated. The dispersion characteristics were found by theoretical analysis, experimental testing, and computer simulation using the codes ARGUS and SOS. Interaction impedances were computed based on the corresponding dispersion characteristics. Finally, an equivalent circuit model for one period of the structure was chosen using equivalent circuit models for cylindrical wave guides of different radii. Optimum values for the discrete capacitors and inductors describing discontinuities between cylindrical wave guides were found using the computer code TOUCHSTONE. Author

N94-33945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THEORETICAL, EXPERIMENTAL, AND COMPUTATIONAL EVALUATION OF A TUNNEL LADDER SLOW-WAVE STRUCTURE
Thomas M. Wallett and A. Haq Qureshi Jun. 1994 19 p
(RTOP 235-01-1C)
(NASA-TM-106642; E-8946; NAS 1.15:106642) Avail: CASI HC A03/MF A01

The dispersion characteristics of a tunnel ladder circuit in a ridged wave guide were experimentally measured and determined by computer simulation using the electromagnetic code MAFIA. To qualitatively estimate interaction impedances, resonance frequency shifts due to a perturbing dielectric rod along the axis were also measured indicating the axial electric field strength. A theoretical modeling of the electric and magnetic fields in the tunnel area was also done. Author

N94-33996*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THEORETICAL, EXPERIMENTAL, AND COMPUTATIONAL EVALUATION OF SEVERAL VANE-TYPE SLOW-WAVE STRUCTURES
Thomas M. Wallett and A. Haq Qureshi Jun. 1994 12 p
(RTOP 235-01-1C)
(NASA-TM-106641; E-8945; NAS 1.15:106641) Avail: CASI HC A03/MF A01

Several types of periodic vane slow-wave structures were fabricated. The dispersion characteristics were found by theoretical analysis, experimental testing, and computer simulation using the MAFIA code. Computer-generated characteristics agreed to approximately within 2 percent of the experimental characteristics for all structures. The theoretical characteristics, however, deviated increasingly as the width to height ratio became smaller. Interaction impedances were also computed based on the experimental and computer-generated resonance frequency shifts due to the introduction of a perturbing dielectric rod. Author

N94-34068# Sandia National Labs., Albuquerque, NM.
AN ASSESSMENT OF RESEARCH AND DEVELOPMENT LEADERSHIP IN ADVANCED BATTERIES FOR ELECTRIC VEHICLES
V. L. Bruch Feb. 1994 36 p
(Contract DE-AC04-94AL-85000)
(DE94-009253; SAND-93-2622) Avail: CASI HC A03/MF A01

Due to the recently enacted California regulations requiring zero emission vehicles be sold in the market place by 1998, electric vehicle research and development (R&D) is accelerating. Much of the R&D work is focusing on the Achilles' heel of electric vehicles -- advanced batteries. This report provides an assessment of the R&D work currently underway in advanced batteries and electric vehicles in the following countries: Denmark, France, Germany, Italy, Japan, Russia, and the United Kingdom. Although the US can be considered one of the leading countries in terms of advanced battery and electric vehicle R&D work, it lags other countries, particularly France, in producing and promoting electric vehicles. The US is focusing strictly on regulations to promote electric vehicle usage while other countries are using a wide variety of policy instruments (regulations, educational outreach programs, tax breaks and subsidies) to encourage the use of electric vehicles. The US should consider implementing additional policy instruments to ensure a domestic market exists for electric vehicles. The domestic is the largest and most important market for the US auto industry. DOE

N94-34149 Department of the Navy, Washington, DC.
ARBITRARY WAVEFORM GENERATOR Patent
Fletcher A. Blackmon, inventor (to Navy) 2 Nov. 1993 8 p
(AD-D016123; US-Patent-5,258,937; US-Patent-Appl-SN-867577; US-Patent-Class-364-728) Avail: US Patent and Trademark Office

An arbitrary waveform generator is capable of producing pulse or continuous waveform signals. It utilizes an EPROM that sends out selected stored digital signals under control of a microprocessor and auxiliary equipment comprised of a clock and an address sequencer. A digital to analog converter receives the digital signals from the EPROM and converts them to analog signals. DTIC

N94-34295 Spire Corp., Bedford, MA.
VISIBLE AND INFRARED (1.54 MICROMETERS) LED BASED ON Er-DOPED POROUS Si Final Report, 1 Jul. - 31 Dec. 1993
Fereydoon Namavar 28 Feb. 1994 35 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-93-C-0040)
(AD-A278528; FR-60291; AFOSR-94-0199TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Phase 1 demonstrated strong room-temperature 1.54 micrometers luminescence from visible light-emitting porous Si doped with erbium. Er was implanted with a dose of 10(exp 15)/sq cm at 190 keV into porous Si, bulk Si, GeSi, quartz, and sapphire. The highest emission intensity was observed for porous Si samples which were annealed at 650 C and had a peak concentration of 1.5 x 10(exp 20) Er/sq cm. However, no IR emission was observed from Er in bulk Si, GeSi, quartz, and sapphire. Our results show that the high photoluminescence (PL) efficiency in Er-implanted porous Si originates from Er confined in less than 5 nm-diameter Si nanostructures. In these samples, only an insignificant decrease in PL intensity was observed

from 77 to 300 K. In addition, phase 1 work clearly indicates that PL intensity is almost comparable to In(0.53)Ga(0.47)As material, which is used for commercial infrared (IR) light-emitting diodes (LED's). These results suggest that Er:porous-Si electroluminescent devices with practical quantum efficiency at 300 K are feasible. DTIC

N94-34404 Department of the Navy, Washington, DC.
ZERO-TIME-DELAY VIDEO PROCESSOR CIRCUIT Patent
Jon H. Bumgardner, inventor (to Navy) 26 Oct. 1993 12 p Filed 1 Nov. 1991
(AD-D016191; US-Patent-5,257,324; US-Patent-Appl-SN-786634; US-Patent-Class-382-44) Avail: US Patent and Trademark Office

A zero-time-delay video processor circuit includes reduction circuitry for receiving a digital image input and providing a reduced and Nyquist acceptable digital image output signal. A controlled write/read memory connected to the reduction circuitry provides the digital image output. A digital estimator is connected to the reduction circuitry for providing an estimated gain signal. A gain corrector circuit is connected to the controlled write/read memory for compensating for errors in the estimated gain. A signal indicative of the true or required gain is provided to the digital estimator and to the gain corrector. DTIC

N94-34333# Nanjing Aeronautical Inst. (China).
INTEGRATED CONTROL AND MANAGEMENT OF ADVANCED AIRCRAFT ELECTRICAL POWER SYSTEM
You-Ren Wang, Yang-Guang Yan, and Shi-Hong Lu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 110-114 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34349# Nanjing Aeronautical Inst. (China). Research Inst. of Vibration Engineering.
STUDY ON ACTIVE CONTROL OF WAVEGUIDE WITH PIEZOCERAMIC ACTUATOR
Ping Tan and Chun-Sheng Zhao *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 187-189 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34350# China Univ. of Mining and Technology.
TIME DELAY MEASUREMENT CORRELATOR AND ITS APPLICATION
Yuan-Qing Fang and Fan-Qin Meng *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 190-192 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34364# Jiangsu Inst. of Tech., Zhenjiang (China). Dept. of Computer Engineering.
DIGITAL CIRCUIT TEST LANGUAGE AND TEST PATTERN DATA BASE
Tie-Jun Xiao, Xin-Rong Chen, Xue-Ying Ma, and Jian-Wen Huang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 253-255 Prepared in cooperation with Academia Sinica, Nanjing, China (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N94-33363 Washington Univ., Seattle, WA.
A LOCALLY ANALYTIC METHOD FOR THE EULER EQUATIONS Ph.D. Thesis
Todd R. Michal 1992 185 p
Avail: Univ. Microfilms Order No. DA9318588

A new procedure for numerically solving the Euler equations has been developed. This procedure combines traditional analytical techniques with modern numerical methods to generate accurate solutions on very coarse grids. This method is developed by constructing asymptotic perturbation solutions within each grid cell. A Legendre-Spectral expansion is used to form these local approximations into a global solution. Solutions are generated for a wide range of applications and comparisons are shown with other numerical methods, experimental data, and analytical results. The efficiency of this method is compared with a representative finite difference code. For some applications, solution computations for a given level of accuracy are shown to require less cpu time than that of a finite difference solution. Dissert. Abstr.

N94-33364 Georgia Inst. of Tech., Atlanta, GA.
A THREE-DIMENSIONAL MULTIGRID TECHNIQUE FOR UNSTEADY INCOMPRESSIBLE VISCOUS FLOWS Ph.D. Thesis
Warn-Gyu Park 1993 227 p
Avail: Univ. Microfilms Order No. DA9318579

A technique for the numerical solution of the two and three dimensional, unsteady, incompressible Navier-Stokes equations is presented. The governing equations are solved in a body-fitted curvilinear coordinate system, which may move or deform with time. A two-point backward difference scheme is used to approximate the time derivative, leading to a first-order accuracy in time. The convective terms are modeled using a third order upwind scheme. The viscous terms are modeled using second order accurate central differences. The continuity equation is modeled using second order accurate central differences. The fourth order artificial damping is added to the continuity equation for numerical stability. The resulting system of nonlinear algebraic equations are iteratively solved at each time step using a point-implicit scheme, enhanced by a multigrid technique. The multigrid iterative process ensures that the discretized form of the unsteady flow equations are satisfied at every time step at every point in the flow field to an acceptable level of tolerance. Sample results are presented for an oscillating airfoil experiencing deep dynamic stall, for steady viscous flow over an ellipsoid of revolution at an angle of attack, for steady viscous flow through a square duct with a 90-degree bend, and for steady viscous flow through a spinning propeller. Good agreements are obtained with measured velocity and pressure distribution in these cases.
Dissert. Abstr.

N94-33390 Naval Surface Warfare Center, Dahlgren, VA.
NUMERICAL SIMULATION OF LATERAL THRUSTERS IN HYPERSONIC FLOW OVER A BICONIC BODY
T. Hsieh and A. B. Wardlaw, Jr. 8 Mar. 1994 40 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277562; NSWCDD/TR-93/138) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A Navier-Stokes simulation of lateral thrusters on a biconic body in hypersonic flow is presented. Due to simplifications arising from symmetry, cruciform thrusters were considered first. A grid convergence was conducted to evaluate computational accuracy. This was followed by the computation of three different jet exit conditions and an assessment of the flow field changes produced by each. Of particular concern was the possibility of entrapment of streamlines from the jet in a recirculation region upstream of the jet. The final case considered was a single jet thrusting from a biconic body at zero incidence at M = 9.7. These results were compared to experimental surface pressures. A description of the complicated interacting flow fields featuring multiple separation and attachment lines/regions is also presented. DTIC

N94-33391 DynaFlow, Inc., Columbus, OH.
METHOD FOR TRANSITION PREDICTION IN HIGH-SPEED BOUNDARY LAYERS, PHASE 2 Final Report, 27 Sep. 1990 - 27 Sep. 1993
T. Herbert, G. K. Stuckert, and N. Lin Sep. 1993 102 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-90-C-3009)
(AD-A277563; WL-TR-93-3097-Phase-2) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The parabolized stability equations (PSE) are a new and more reliable approach to analyzing the stability of streamwise varying flows such as boundary layers. This approach has been previously validated for idealized incompressible flows. Here, the PSE are formulated for highly compressible flows in general curvilinear coordinates to permit the analysis of high-speed boundary-layer flows over fairly general bodies. Vigorous numerical studies are carried out to study convergence and accuracy of the linear-stability code LSH and the linear/nonlinear PSE code PSH. Physical interfaces are set up to analyze the M = 8 boundary layer over a blunt cone calculated by using a thin-layer Navier Stokes (TNLS) code and the flow over a sharp cone at angle of attack calculated using the AFWAL parabolized Navier-Stokes (PNS) code. While stability and transition studies at high speeds are far from routine, the method developed here is the best tool available to research the physical processes in high-speed boundary layers. DTIC

N94-33396 Illinois Inst. of Tech., Chicago, IL. Fluid Dynamics Research Center.
CONTROL AND MANAGEMENT OF UNSTEADY AND TURBULENT FLOWS Final Report, Apr. 1990 - Dec. 1993
H. Nagib, M. Acharya, T. Corke, C. Wark, and D. Williams Dec. 1993 36 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0173-90)
(AD-A278474; AFOSR-94-0190TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Active input of tuned and detuned two dimensional and oblique modes in a layer was found to lead to the growth of near-subharmonic modes as well as numerous sum and difference modes, thereby emulating 'natural' transition. Acoustic receptivity of laminar boundary layers with nonlocalized low-amplitude periodic waviness was experimentally investigated and compared favorably to theoretical predictions. Closed loop excitation of axisymmetric and azimuthal modes in a free round jet were used to reveal the character of high Reynolds number transition (i.e., supercritical Hopf bifurcation) and to study mode selection and switching. Suction and blowing were shown to be capable of controlling the asymmetric flow about the forebodies of aircraft and missiles and the experiments indicate that the suction bleed coefficient must increase like the 3.9 power of the velocity to balance the effects of geometric instability at the tip. The effects of yaw on such asymmetries were also documented. A strategy to suppress the dynamic-stall vortex over a range of operating parameters, using controlled leading-edge suction to prevent accumulation of reverse-flowing fluid, was successfully developed from a study of the mechanisms responsible for the evolution of the vortex. The National Diagnostic Facility was completed and several collaborative experiments are scheduled during 1994. DTIC

N94-33414 Pennsylvania State Univ., University Park, PA. Dept. of Mechanical Engineering.
TURBULENCE STRUCTURE ASSOCIATED WITH INTERCOMPONENT AND INTERSCALE ENERGY TRANSFER AND MODIFICATION BY FORCING Final Technical Report, 1 Nov. 1988 - 31 Oct. 1993
James G. Brasseur 31 Dec. 1993 11 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0026-89)
(AD-A278269; AFOSR-94-0208TR) Avail: CASI HC A03

There are two parts to this research program. First program focusses on the quantification of loosely held concepts such as 'structure' and the 'dynamic significance' of structure in the study of turbulent flows in general and shear flows in particular. We have developed a robust algorithm which extracts regions of concentrated activity in a fluctuating turbulence variable and labels each region individually for quantitative and graphical analysis and applied the technique to the combined visual and quantitative analysis of vorticity, strain-rate, Reynolds stress, and turbulent kinetic energy in the transition for isotropic to shear-dominated homogeneous turbulence. The focus of the second program is on interscale interactions in high Reynolds number turbulence, with a particular focus on the direct interaction between large and small scales in the dynamic evolution of equilibrium and nonequilibrium turbulent flows. Analytical analysis has demonstrated the persistence of these interactions in the high Reynolds number limit and basic analysis of the limiting triadic form of the Navier-Stokes equation has appeared in several publications based on predictions made from the asymptotic triadic equations, we have analyzed the dynamics of direct large-small scale couplings through direct numerical simulations of initially isotropic turbulence forced anisotropically the large scales and found that large scale restructuring can dramatically alter small scale structure and dynamics. DTIC

N94-33432*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
INTERACTION OF OBLIQUE INSTABILITY WAVES WITH WEAK STREAMWISE VORTICES
M. E. Goldstein and David W. Wundrow May 1994 53 p
(RTOP 505-90-51)
(NASA-TM-106584; E-8845; NAS 1.15:106584) Avail: CASI HC A04/MF A01

This paper is concerned with the effect of a weak spanwise-variable mean-flow distortion on the growth of oblique instability waves in a Blasius boundary layer. The streamwise component of the distortion velocity initially grows linearly with increasing streamwise distance, reaches a maximum, and eventually decays through the action of viscosity. This decay occurs slowly and allows the distortion to destabilize the Blasius flow over a relatively large streamwise region. It is shown that even relatively weak distortions can cause certain oblique Rayleigh instability waves to grow much faster than the usual two-dimensional Tollmien-Schlichting waves that would be the dominant instability modes in the absence of the distortion. The oblique instability waves can then become large enough to interact nonlinearly within a common critical layer. It is shown that the resulting nonlinearity is weak and that the common amplitude of the interacting oblique waves is governed by the amplitude evolution equation derived in Goldstein & Choi (1989). The implications of these results for Klebanoff-type transition are discussed. Author

N94-33433*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
A PREDICTOR-CORRECTOR SCHEME FOR VORTEX IDENTIFICATION Final Report
Bart A. Singer (High Technology Corp., Hampton, VA.) and David C. Banks Mar. 1994 23 p Submitted for publication
(Contracts NAS1-19480; NAS1-19299; RTOP 505-90-52-01)
(NASA-CR-194882; NAS 1.26:194882; ICASE-94-11) Avail: CASI HC A03/MF A01

A new algorithm for identifying and characterizing vortices in complex flows is presented. The scheme uses both the vorticity and pressure fields. A skeleton line along the center of a vortex is produced by a two-step predictor-corrector scheme. The technique uses the vector field to move in the direction of the skeleton line and the scalar field to correct the location in the plane perpendicular to the skeleton line. A general vortex cross section can be concisely defined with five parameters at each point along the skeleton line. The details of the method and examples of its use are discussed. Author

N94-33556# Calspan-Buffalo Univ. Research Center, NY.
EXPERIMENTAL STUDIES OF HYPERSONIC TRANSITIONAL AND TURBULENT BOUNDARY LAYERS IN HYPERSONIC FLOW Final Report, 1 Jul. 1991 - 31 Aug. 1993
Michael S. Holden 13 Dec. 1993 135 p
(Grant AF-AFOSR-0273-91)
(AD-A278441; AFOSR-94-0156TR) Avail: CASI HC A07/MF A02

The objective of this program of fundamental research in turbulent flows is to advance the experimental knowledge of the detailed structure and turbulent mechanisms in regions of attached and separated turbulent hypersonic flows. The experimental program is being conducted in high Reynolds number hypersonic flows for high-enthalpy conditions where compressibility and turbulent non-equilibrium effects are believed to be of

key importance. Three basic studies are being conducted under the current effort. The first is an experimental program in which detailed characteristics of the turbulent structures are being obtained using electron-beam techniques. In the second study, we have examined transitional and turbulent flows along the stagnation line of a highly-swept cylinder. In the third program segment, we have been analyzing and compiling a database of detailed experimental measurements which will be used as a basis for code validation studies. During the past year, these studies have been presented and discussed in a number of informal and formal meetings including an ALAA presentation in Huntsville. DTIC

N94-33597# Texas Univ., Austin, TX. Inst. for Fusion Studies.
HAMILTONIAN DESCRIPTION OF THE IDEAL FLUID
P. J. Morrison Jan. 1994 96 p
(Contract DE-FG05-80ET-53088)
(DE94-007372; DOE/ET-53088/640; IFSR-640) Avail: CASI HC A05/MF A01

Fluid mechanics is examined from a Hamiltonian perspective. The Hamiltonian point of view provides a unifying framework; by understanding the Hamiltonian perspective, one knows in advance (within bounds) what answers to expect and what kinds of procedures can be performed. The material is organized into five lectures on the following topics: rudiments of few-degree-of-freedom Hamiltonian systems illustrated by passive advection in two dimensional fluids; functional differentiation, two action principles of mechanics, and the action principle and canonical Hamiltonian description of the ideal fluid; noncanonical Hamiltonian dynamics with examples; tutorial on Lie groups and algebras, reduction-realization, and Clebsch variables; and stability and Hamiltonian systems. DOE

N94-33607*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
EXPERIMENTAL INVESTIGATION OF JET-INDUCED MIXING OF A LARGE LIQUID HYDROGEN STORAGE TANK
C. S. Lin (Analex Corp., Brook Park, OH.), M. M. Hasan, and N. T. VanDresar Jun. 1994 12 p Presented at the 6th Joint Thermophysics and Heat Transfer Conference, Colorado Springs, CO, 20-23 Jun. 1994; sponsored by AIAA and ASME
(Contract NAS3-25776; RTOP 506-42-73)
(NASA-TM-106629; E-8926; NAS 1.15:106629; AIAA Paper 94-2079)
Avail: CASI HC A03/MF A01

Experiments have been conducted to investigate the effect of fluid mixing on the depressurization of a large liquid hydrogen storage tank. The test tank is approximately ellipsoidal, having a volume of 4.89 m(exp 3) and an average wall heat flux of 4.2 W/m(exp 2) due to external heat input. A mixer unit was installed near the bottom of the tank to generate an upward directed axial jet flow normal to the liquid-vapor interface. Mixing tests were initiated after achieving thermally stratified conditions in the tank either by the introduction of hydrogen gas into the tank or by self-pressurization due to ambient heat leak through the tank wall. The subcooled liquid jet directed towards the liquid-vapor interface by the mixer induced vapor condensation and caused a reduction in tank pressure. Tests were conducted at two jet submergence depths for jet Reynolds numbers from 80,000 to 495,000 and Richardson numbers from 0.014 to 0.52. Results show that the rate of tank pressure change is controlled by the competing effects of subcooled jet flow and the free convection boundary layer flow due to external tank wall heating. It is shown that existing correlations for mixing time and vapor condensation rate based on small scale tanks may not be applicable to large scale liquid hydrogen systems. Author

N94-33702 Arizona State Univ., Tempe, AZ. Dept. of Mathematics.
SPATIO-TEMPORAL COMPLEXITY AND LARGE-SCALE STRUCTURES IN PROBLEMS OF CONTINUUM MECHANIC Final Report, 1 Sep. 1989 - 15 Jul. 1993
Basil Nicolaenko, Dieter Armbruster, Alp Eden, and Eric Kostelich 15 Jul. 1993 13 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0507-89)
(AD-A278473; AFOSR-94-0144TR) Avail: CASI HC A03

We have investigated some difficulties in estimating dynamics from time-delay embeddings of experimental data that can be characterized as low-dimensional. A new procedure is developed to reduce noise by exploiting the properties of saddle periodic orbits on the reconstructed attractor. Most of these methods involve the estimation of a derivative form the data or in some way require a least squares estimate of the location of some portion of the attractor. Our work addresses some of the problems inherent in the estimation of dynamics from data, regardless of the type of model used to approximate the dynamics. These difficulties may arise from the fractal structure of the attractor and errors in all the observations. The problems persist regardless of the amount of available data and affect one's ability to determine an accurate local model of the dynamics, even when an accurate model should be obtainable in principle. Many of these problems can be circumvented by using as much dynamical information as possible in the formulation of the statistical relationship between the observations. Our attempt to do this involves the use of recurrent orbits to derive an accurate linear model of the dynamics-in the-vicinity of saddle periodic orbits on-the attractor. We have applied our method to two experimental data sets from Taylor-Couette flows. DTIC

N94-33754# Princeton Univ., NJ. Dept. of Mechanical and Aerospace Engineering.
THE STRUCTURE OF HIGH REYNOLDS NUMBER TURBULENT BOUNDARY LAYERS Final Report, 1 Apr. 1990 - 31 Mar. 1993
Alexander J. Smits 18 Oct. 1993 23 p
(Grant AF-AFOSR-0217-90)
(AD-A278489; AFOSR-94-0226TR) Avail: CASI HC A03/MF A01

This report is the final technical report for AFOSR URI Grant 90-0217. The effort described in this report is the Princeton part of a joint effort among Penn State University, Princeton University, and Yale University to try to improve understanding of the turbulent boundary layer at high Reynolds numbers. DTIC

N94-33773 New York Univ., New York, NY. Inst. of Mathematical Sciences.
ADAPTIVE METHODS FOR COMPRESSIBLE FLOW Final Technical Report, 1 Nov. 1990 - 30 Nov. 1993
Marsha Berger 1 Mar. 1994 76 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0063-91)
(AD-A277861; AFOSR-94-0131TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The goal of this research is the development of adaptive computational methods to numerically simulate fluid flows around complex configurations in an automatic fashion. Grid generation continues to be a huge impediment for computer simulations of realistic fluid flows. This is true for both body-fitted structured grid solvers and unstructured grid approaches. We are developing a Cartesian grid representation of the geometry, where the object is simply cut out of the Cartesian grid. We are also investigating the suitability of adaptive methods on parallel computers. DTIC

N94-33841# Lawrence Livermore National Lab., CA.
SIMULATION OF ROTARY-DRUM AND REPOSE TESTS FOR FRICTIONAL SPHERES AND RIGID SPHERE CLUSTERS
O. R. Walton and R. L. Braun Nov. 1993 18 p Presented at the 5th Joint DOE/NSF Workshop on Flow of Particulates, Ithaca, NY, 29 Sep. - 1 Oct. 1993
(Contract W-7405-eng-48)
(DE94-008094; UCRL-JC-115749; CONF-9309310-2) Avail: CASI HC A03/MF A01

The effects of rotation rate and interparticle friction on the bulk flow behavior in rotating horizontal cylinders are studied via particle-dynamic simulations. Assemblies of inelastic, frictional spheres and rigid sphere clusters are utilized, and rotation rates from quasistatic to centrifuging are examined. Flow phenomena explored include size segregation, avalanching, slumping, and centrifuging. Simulated drum flows with two sizes of frictional spheres showed very rapid segregation of species perpendicular to the drum axis; however, simulations of up to 10 revolutions, utilizing periodic-boundary ends, did not exhibit the experimentally observed axial segregation into stripes. Angles of repose for uniform-sized spheres in slowly rotating cylinders varied from 13 to 31 degrees as the friction coefficient varied from 0.02 to 1.0. For simulated rotation rates higher than the threshold to obtain uniform flow conditions, the apparent angle of repose increases as the rotation rate increases, consistent with experiments. Also, simulations with rigid clusters of four spheres in a tetrahedral shape

or eight spheres in a cubical arrangement, demonstrate that particle shape strongly influences the repose angle. Simulations of cubical eight-sphere clusters, with a surface coefficient of friction of 0.1, produced apparent angles of repose exceeding 35 degrees, compared to 23 degrees for assemblies of single spheres interacting with the same force model parameters. Centrifuging flows at very high rotation rates exist as stationary beds moving exactly as the outer rotating wall. At somewhat slower speeds the granular bed remains in contact with the wall but exhibits surface sliding down the rising inner bed surface, moving a short distance on each revolution. At still slower speeds particles rain from the surface of the upper half of the rotating bed. DOE

N94-33846 DynaFlow, Inc., Columbus, OH.
SOFTWARE USER'S MANUAL FOR STABILITY AND TRANSITION ANALYSIS WITH THE CODES LSH AND PSH Final Report, 27 Sep. 1990 - 27 Sep. 1993
T. Herbert, G. K. Stuckert, and N. Lin Sep. 1993 74 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-90-C-3009)
(AD-A277593; WL-TR-93-3096) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This manual describes how to use the local linear stability code LSH and the nonlinear Parabolized Stability Equations (PSE) solver PSH for compressible flows. Both codes are adaptable to analysis of different flows over fairly general shapes of bodies. For analysis of a new problem, the user may specify the basic state, the coordinate system, dependent disturbance variables and their boundary conditions to be used for the stability analysis through physics insert files. Once these preliminary steps are completed, different tasks of stability analysis and PSE calculations can be carried out by simple modifications of a few input files. Both codes are highly modular and closely integrated. Output data from LSH can be used directly as initial data for PSH runs. Examples of several insert files and input files of the built-in problems are given to assist the user in setting up a new problem. DTIC

N94-33884# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.
SPECIAL COURSE ON PROGRESS IN TRANSITION MODELLING [PROGRES DANS LA MODELISATION DE LA TRANSITION]
Apr. 1994 276 p Special course held in Madrid, Spain, 22-25 Mar. 1993 and in Rhode-Saint-Genese, Belgium, 29 Mar. - 1 Apr. 1993
(AGARD-R-793; ISBN-92-835-0742-8) Copyright Avail: CASI HC A13/MF A03

Lecture notes for the AGARD Fluid Dynamics Panel (FDP) Special Course on 'Progress in Transition Modelling' have been assembled in this Report. The aim and scope of this Course was to provide information on new developments in modelling the dynamics of transition to turbulence, and the prediction of transition in boundary-layer flows. Specifically, topics and methods covered include: a physical description of boundary-layer transition, linear theory, asymptotic techniques, parabolized stability equations, direct numerical simulations, empirical methods and closure of the Reynolds' averaged Navier-Stokes equations. The material assembled in this report was prepared and presented under the combined sponsorship of the AGARD Fluid Dynamics Panel, and the von Karman Institute (VKI) for Fluid Dynamics. For individual titles, see N94-33885 through N94-33890.

N94-33885*# Arizona State Univ., Tempe, AZ. Dept. of Mechanical and Aerospace Engineering.
PHYSICAL DESCRIPTION OF BOUNDARY-LAYER TRANSITION: EXPERIMENTAL EVIDENCE
William S. Saric *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 51 p (For primary document see N94-33884 10-34)
(Grants NAG1-1111; AF-AFOSR-0234-90)
Copyright Avail: CASI HC A04/MF A03

The problems of understanding the origins of turbulent flow and transition to turbulent flow are the most important unsolved problems of fluid mechanics and aerodynamics. It is well known that the stability, transition, and turbulent characteristics of bounded shear layers are fundamentally different from those of free shear layers. Likewise, the stability, transition, and turbulent characteristics of open systems are fundamentally different from those of closed systems. Because of the influence of indigenous disturbances, surface geometry and roughness, sound, heat transfer, and ablation, it is not possible to develop general prediction schemes for transition location and the nature of turbulent structures in boundary-layer flows. At the present time no mathematical model exists that can predict the transition Reynolds number on a flat plate. The recent progress in this area is encouraging, in that a number of distinct transition mechanisms have been found experimentally. The theoretical work finds them to be amplitude and Reynolds-number dependent. The theory remains rather incomplete with regard to predicting transition. Amplitude and spectral characteristics of the disturbances inside the laminar viscous layer strongly influence which type of transition occurs. The major need in this area is to understand how freestream disturbances are entrained into the boundary layer, i.e., to answer the question of receptivity. We refer receptivity to the mechanism(s) that cause freestream disturbances to enter the boundary layer and create the initial amplitudes for unstable waves. Derived from text

N94-33886# Centre d'Etudes et de Recherches, Toulouse (France). Dept. of Aerothermodynamics.
BOUNDARY LAYER TRANSITION: PREDICTIONS BASED ON LINEAR THEORY
Daniel Arnal *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 63 p (For primary document see N94-33884 10-34)
Copyright Avail: CASI HC A04/MF A03

The objective of this paper is to discuss the possibilities of transition prediction by using the eigenvalues of the classical linear stability equations. Emphasis is placed on the e(sup n) method, with applications to two- and three-dimensional flows. It is shown that the value of the n factor at the onset of transition depends on the disturbance environment. On swept wings, it depends also on the procedure which is adopted to integrate the growth rates. In spite of its shortcomings (the receptivity and the nonlinear processes are not accounted for), the e(sup n) method is useful for parametric studies. Applications to the attachment line flow and to the Gortler instability are also presented. Author

N94-33887# Cambridge Univ., Cambridge (England).
ASYMPTOTIC APPROACHES TO TRANSITION MODELLING
Stephen J. Cowley and Xue-Song Wu *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 38 p (For primary document see N94-33884 10-34)
Copyright Avail: CASI HC A03/MF A03

The linear and nonlinear evolution of unstable disturbances in high-Reynolds-number flows is reviewed from the perspective of asymptotic theory. For non-parallel and/or unsteady flows, quasi-parallel and quasi-steady approximations can only be strictly justified by asymptotic expansions based on the smallness of the inverse Reynolds number. Further, such an asymptotic approach allows the inclusion of nonlinear effects in a self-consistent manner. Attention is focussed primarily on three asymptotic regions: the lower-branch Tollmien-Schlichting (TS) scaling for boundary layers, the upper-branch TS scaling for boundary layers, and the Rayleigh scaling for (decelerating) boundary layers, free shear layers, jets and wakes. For fixed frequency disturbances in a decelerating boundary layer, these asymptotic regions occur at increasing distances from the leading edge. A disturbance propagating downstream from the leading edge will pass through each region in turn. The larger the initial disturbance, the further upstream nonlinear effects must be taken into account. Weakly nonlinear theory is possible when the relative growth-rate of disturbances is small, e.g. near a neutral curve. Close to the lower branch, it is possible to take into account non-parallelism, wavetrain modulation (i.e. wavepackets), and three dimensional effects such as those that lead to TS-wave/vortex interactions. A number of different models are described and critically assessed. Similar possibilities are examined on the upper-branch scaling, where an additional feature is the effect of nonlinear critical layers. Critical layers play a preeminent role on the Rayleigh scaling. Physical effects explained include the nonlinear saturation of two-dimensional disturbances in free shear layers and decelerating boundary layers, the explosive growth in amplitude of three dimensional disturbances, and the generation of surprisingly large longitudinal vortices and spanwise-dependent mean flows. Author

N94-33888*# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
PARABOLIZED STABILITY EQUATIONS
Thorwald Herbert (DynaFlow, Inc., Columbus, OH.) *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 34 p (For primary document see N94-33884 10-34)
(Contracts NAS3-26602; NAS2-13513; F49620-92-J-0271; F33615-90-C-3009; N00014-90-J-1520; AF-AFOSR-0262-91)
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The parabolized stability equations (PSE) are a new approach to analyze the streamwise evolution of single or interacting Fourier modes in weakly nonparallel flows such as boundary layers. The concept rests on the decomposition of every mode into a slowly varying amplitude function and a wave function with slowly varying wave number. The neglect of the small second derivatives of the slowly varying functions with respect to the streamwise variable leads to an initial boundary-value problem that can be solved by numerical marching procedures. The PSE approach is valid in convectively unstable flows. The equations for a single mode are closely related to those of the traditional eigenvalue problems for linear stability analysis. However, the PSE approach does not exploit the homogeneity of the problem and, therefore, can be utilized to analyze forced modes and the nonlinear growth and interaction of an initial disturbance field. In contrast to the traditional patching of local solutions, the PSE provide the spatial evolution of modes with proper account for their history. The PSE approach allows studies of secondary instabilities without the constraints of the Floquet analysis and reproduces the established experimental, theoretical, and computational benchmark results on transition up to the breakdown stage. The method matches or exceeds the demonstrated capabilities of current spatial Navier-Stokes solvers at a small fraction of their computational cost. Recent applications include studies on localized or distributed receptivity and prediction of transition in model environments for realistic engineering problems. This report describes the basis, intricacies, and some applications of the PSE methodology. Author

N94-33889*# Arizona State Univ., Tempe, AZ. Dept. of Mechanical and Aerospace Engineering.
DIRECT NUMERICAL SIMULATION OF TRANSITION: THE SPATIAL APPROACH
Helen L. Reed *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 46 p Sponsored by NASA. Langley Research Center; AFOSR; and NSF (For primary document see N94-33884 10-34)
Copyright Avail: CASI HC A03/MF A03

The objective of this paper is to review the efforts in spatial direct numerical simulations for transition modeling. Much recent success has been realized in the development of more efficient numerical algorithms as well as a robust downstream boundary condition. Efforts at explaining complex physical phenomena through the use of simulations are reviewed. Author

N94-33890*# High Technology Corp., Hampton, VA.
MODELING THE TRANSITION REGION
Bart A. Singer *In* AGARD, Special Course on Progress in Transition Modelling Apr. 1994 33 p (For primary document see N94-33884 10-34)
(Contract NAS1-19299)
Copyright Avail: CASI HC A03/MF A03

The calculation of engineering flows undergoing laminar-turbulent transition presents special problems. Mean-flow quantities obey neither the fully laminar nor the fully turbulent correlations. In addition, local maxima in skin friction, wall temperature, and heat transfer often occur near the end of the transition region. Traditionally, modeling this region has been important for the design of turbine blades, where the transition region is long in relation to the chord length of the blade. More recently, the need for better transition-region models has been recognized by designers of hypersonic vehicles where the high Mach number, the low Reynolds number, and the low-disturbance flight environment emphasize the importance of the transition region. Needless to say, a model that might work well for the transitional flows typically found in gas turbines will not necessarily work well for the external surface of a hypersonic vehicle. In Section 2 of this report, some of the important flow features that control the transition region will be discussed. In Section 3, different approaches to the modeling problem will be summarized and cataloged. Fully turbulent flow models will be discussed in detail in Section 4; models specifically designed for transitional flow, in Section 5; and the evaluation of models, in Section 6. Derived from text

N94-33897*# High Technology Corp., Hampton, VA.
ACOUSTIC RECEPTIVITY OF COMPRESSIBLE BOUNDARY LAYERS: RECEPTIVITY BY WAY OF SURFACE-TEMPERATURE VARIATIONS
Meelan Choudhari Jun. 1994 36 p
(Contract NAS1-20059; RTOP 505-59-50-01)
(NASA-CR-4599; NAS 1.26:4599) Avail: CASI HC A03/MF A01

The Goldstein-Ruban theory has been extended within the framework of Zavol'skii et al. to study the acoustic receptivity of compressible boundary layers. We consider the receptivity produced in a region of localized, small-amplitude variation in the surface temperature and compare it with the receptivity that is induced through a similar mechanism by a variation in the suction velocity at the surface. It is found that the orientation of the acoustic wave can have a significant impact on the receptivity process, with the maximum receptivity at a given sound-pressure level being produced by upstream oriented acoustic waves. At sufficiently low Mach numbers, the variation of receptivity with the acoustic-wave orientation can be predicted analytically and is the same for both surface suction and surface heating. However, as a result of the acoustic refraction across the mean boundary layer, the above dependence can become rather complex and, also, dependent on the type of surface nonuniformity. The results also suggest that the receptivity caused by temperature nonuniformities may turn out to be more significant than that produced by the mean-flow perturbations associated with strip suction. Author

N94-33941*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
VISUALIZATION OF SECONDARY FLOW DEVELOPMENT IN HIGH ASPECT RATIO CHANNELS WITH CURVATURE
Michael L. Meyer and James E. Giuliani Jun. 1994 14 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-29 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE
(RTOP 232-01-0A)
(NASA-TM-106658; E-8972; NAS 1.15:106658; AIAA Paper 94-2979)
Avail: CASI HC A03/MF A01

The results of an experimental project to visually examine the secondary flow structure that develops in curved, high aspect-ratio rectangular channels are presented. The results provide insight into the fluid dynamics within high aspect ratio channels. A water flow test rig constructed out of plexiglass, with an adjustable aspect ratio, was used for these experiments. Results were obtained for a channel geometry with a hydraulic diameter of 10.6 mm (0.417 in.), an aspect ratio of 5.0, and a hydraulic radius to curvature radius ratio of 0.0417. Flow conditions were varied to achieve Reynolds numbers up to 5,100. A new particle imaging velocimetry technique was developed which could resolve velocity information from particles entering and leaving the field of view. Time averaged secondary flow velocity vectors, obtained using this velocimetry technique, are presented for 30 degrees, 60 degrees, and 90 degrees into a 180 degrees bend and at a Reynolds number of 5,100. The secondary flow results suggest the coexistence of both the classical curvature induced vortex pair flow structure and the eddies seen in straight turbulent channel flow. Author (revised)

N94-33965# Old Dominion Univ., Norfolk, VA.
REACTING COMPRESSIBLE MIXING LAYERS: STRUCTURE AND STABILITY Final Report, 1 Jul. 1991 - 30 Jun. 1993
Chester Grosch 31 Oct. 1993 54 p
(Grant AF-AFOSR-0250-91)
(AD-A278319; AFOSR-94-0206TR) Avail: CASI HC A04/MF A01

The contract is in support of research on the structure and stability of reacting compressible mixing layers. The research performed under this contract has resulted in our learning a great deal about the structure and stability of reacting compressible mixing layers. DTIC

N94-33970# Arizona State Univ., Tempe, AZ. Dept. of Mechanical and Aerospace Engineering.
TRANSITION RECEPTIVITY AND CONTROL: COMPUTATIONS Final Technical Report, 15 Mar. 1990 - 30 Sep. 1993

Helen L. Reed and William S. Saric 1 Mar. 1994 50 p
(Grant AF-AFOSR-0234-90)
(AD-A278339; AFOSR-94-0165TR) Avail: CASI HC A03/MF A01

We modeled the receptivity of the laminar boundary layer on a semi-infinite flat plate with a modified super-elliptic leading edge using a spatial direct numerical simulation. The incompressible flow was simulated by solving the governing full Navier-Stokes equations in general curvilinear coordinates by a finite-difference method. First, the steady basic-state solution was obtained in a transient approach using spatially varying time steps. Then, time-harmonic oscillations of the freestream streamwise velocity, modeling sound or spanwise vorticity, were applied as unsteady boundary conditions, and the governing equations were solved to evaluate the spatial and temporal developments of the perturbation leading to instability waves in the boundary layer. The effects of leading-edge radius and geometry on receptivity were determined. The work was closely coordinated with the experimental program. The computational work was also extended to solve the parabolized Navier-Stokes equations for the evolution of Gortler vortices in the presence of concave and convex curvature. Experiments were conducted on the receptivity of T-S waves to freestream sound in four different cases: (1) two-dimensional roughness elements; (2) the interaction and control of T-S waves with 2-D roughness; (3) three-dimensional roughness clements; and (4) the leading edge. T-S wave amplitudes were measured as a function of freestream sound level and the roughness height for both 2-D and 3-D roughness elements. DTIC

N94-33999*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TURBULENCE COMPRESSIBILITY CORRECTIONS
T. J. Coakley, C. C. Horstman, J. G. Marvin, J. R. Viegas, J. E. Bardina, P. G. Huang, and M. I. Kussoy May 1994 38 p
(RTOP 505-70-59)
(NASA-TM-108827; A-94091; NAS 1.15:108827) Avail: CASI HC A03/MF A01

The basic objective of this research was to identify, develop and recommend turbulence models which could be incorporated into CFD codes used in the design of the National AeroSpace Plane vehicles. To accomplish this goal, a combined effort consisting of experimental and theoretical phases was undertaken. The experimental phase consisted of a literature survey to collect and assess a database of well documented experimental flows, with emphasis on high speed or hypersonic flows, which could be used to validate turbulence models. Since it was anticipated that this database would be incomplete and would need supplementing, additional experiments in the NASA Ames 3.5-Foot Hypersonic Wind Tunnel (HWT) were also undertaken. The theoretical phase consisted of identifying promising turbulence models through applications to simple flows, and then investigating more promising models in applications to complex flows. The complex flows were selected from the database developed in the first phase of the study. For these flows it was anticipated that model performance would not be entirely satisfactory, so that model improvements or corrections would be required. The primary goals of the investigation were essentially achieved. A large database of flows was collected and assessed, a number of additional hypersonic experiments were conducted in the Ames HWT, and two turbulence models (kappa-epsilon and kappa-omega models with corrections) were determined which gave superior performance for most of the flows studied and are now recommended for NASP applications.
Author

N94-34015# Lawrence Livermore National Lab., CA.
FLOW THROUGH THREE-DIMENSIONAL ARRANGEMENTS OF CYLINDERS WITH ALTERNATING STREAMWISE PLANAR TILT Final Report
M. Sahraoui (Michigan Univ., Ann Arbor.), H. Marshall (Michigan Univ., Ann Arbor.), and M. Kaviany (Michigan Univ., Ann Arbor.) 14 Sep. 1993 16 p
(Contract W-7405-eng-48)
(DE94-008968; UCRL-CR-115875) Avail: CASI HC A03/MF A01

In this report, fluid flow through a three-dimensional model for the fibrous filters is examined. In this model, the three-dimensional Stokes equation with the appropriate periodic boundary conditions is solved using the finite volume method. In addition to the numerical solution, we attempt to model this flow analytically by using the two-dimensional extended analytic solution in each of the unit cells of the three-dimensional structure. Particle trajectories computed using the superimposed analytic solution of the flow field are closed to those computed using the numerical solution of the flow field. The numerical results show that the pressure drop is not affected significantly by the relative angle of rotation of the cylinders for the high porosity used in this study (epsilon = 0.8 and epsilon = 0.95). The numerical solution and the superimposed analytic solution are also compared in terms of the particle capture efficiency. The results show that the efficiency predictions using the two methods are within 10% for St = 0.01 and 5% for St = 100. As the the porosity decreases, the three-dimensional effect becomes more significant and a difference of 35% is obtained for epsilon = 0.8. DOE

N94-34016# Lawrence Livermore National Lab., CA.
AN IMPROVED ANALYTIC SOLUTION FOR ANALYSIS OF PARTICLE TRAJECTORIES IN FIBROUS, TWO-DIMENSIONAL FILTERS
H. Marshall (Michigan Univ., Ann Arbor.), M. Sahraoui (Michigan Univ., Ann Arbor.), and M. Kaviany (Michigan Univ., Ann Arbor.) Sep. 1993 47 p
(Contract W-7405-eng-48)
(DE94-008969; UCRL-CR-115876) Avail: CASI HC A03/MF A01

The Kuwabara solution for creeping fluid flow through periodic arrangement of cylinders is widely used in analytic and numerical studies of fibrous filters. Numerical solutions have shown that the Kuwabara solution has systematic errors and when used for the particle trajectories in filters it results in some error in the predicted filter efficiency. The numerical solutions although accurate, preclude further analytic treatments and are not as compact and convenient to use as the Kuwabara solution. By re-examining the outer boundary conditions of the Kuwabara solution, we have derived a correction term to the Kuwabara solution to obtain an extended solution that is more accurate and improves prediction of the filter efficiency. By comparison with the numerical solutions, it is shown that the Kuwabara solution is the high porosity asymptote and that the extended solution has an improved porosity dependence. We explain a rectification which can make particle collection less efficient for periodic, in-line arrangements of fibers with particle diffusion or body force. This rectification also results in the alignment of particles with inertia (i.e., high Stokes number particles). DOE

N94-34067# Institute of Sound and Vibration Research, Southampton (England).
SONOLUMINESCENCE FROM FLOW OVER A HYDROFOIL IN A CAVITATION TUNNEL
T. G. Leighton and J. E. Field Aug. 1993 37 p
(ISVR-TR-223) Avail: CASI HC A03/MF A01

This report contains a short outline of the subjective aspects of the project, including the environment, benefits and success, particularly as they relate to the pre-set objectives. This is followed by an in-depth technical report. The outstanding feature of this work has been the large data sets which have been obtained, and which must be manipulated in order that conclusions may be drawn. Since the task is considerable, some data manipulation is still proceeding, but the results that have been obtained to date are enclosed. The full results and conclusions will be published in the established literature, copies of which will be forwarded to the Royal Society and the Royal Academy of Engineering. Derived from text

N94-34097# Los Alamos National Lab., NM.
A MULTIMATERIAL FORMALISM
B. A. Kashiwa and R. M. Rauenzahn 1994 10 p Presented at the 1994 ASME Fluids Engineering Summer Meeting, Lake Tahoe, NV, 19-23 Jun. 1994
(Contract W-7405-eng-36)
(DE94-009300; LA-UR-94-771; CONF-940659-6) Avail: CASI HC A02/MF A01

This is the first of two articles concerned with the simulation of multiphase flows. The discussion begins here with a derivation of the exact, ensemble-average equations. Examples of the most basic closures are given, and the well-posedness of the equations is demonstrated in the context of forward-time numerical solution procedures. DOE

N94-34130*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

EFFECT OF PRESSURE GRADIENT ON FIRST MODE OF INSTABILITY IN HIGH-SPEED BOUNDARY LAYERS Final Report

Jamal A. Masad (High Technology Corp., Hampton, VA.) and Yousef H. Zurigat (Jordan Univ., Amman.) Apr. 1994 52 p Submitted for publication

(Contracts NAS1-19299; NAS1-19480; RTOP 505-90-52-01)

(NASA-CR-194910; NAS 1.26:194910; ICASE-94-31) Avail: CASI HC A04/MF A01

The effect of a pressure gradient on the first mode of instability of compressible subsonic and supersonic boundary layers is investigated using linear stability theory. Formulations are presented for nonsimilar boundary-layer mean flow and linear quasi-parallel stability problems that account for variable fluid properties. A pressure gradient is studied that generates potential-flow Mach number distributions at the edge of the boundary layer of the form M(sub e) = cx(sub n), where c is a constant and x is the dimensionless streamwise distance. Variations are calculated for the maximum growth rates of three-dimensional first-mode waves with different edge Mach numbers and different levels of both adverse and favorable pressure gradients. A favorable pressure gradient is shown to have a stabilizing effect on first-mode waves. However, at high edge Mach numbers, a favorable pressure gradient becomes less effective in stabilizing first-mode waves. The frequencies and streamwise and spanwise wave numbers that correspond to the maximum growth rates of first-mode waves decrease as the pressure gradient become more favorable at all Mach numbers when the Reynolds number R = 1500 and at M(sub e) is greater than or equal to 2 when R = 600. Setting the Prandtl number to unity significantly increases the maximum growth rates of first- and second-mode waves at high Mach numbers compared with setting it to the realistic value of 0.72. Author

N94-34138# Lawrence Livermore National Lab., CA.

VERIFICATION AND BENCHMARK TESTING OF THE NUFT COMPUTER CODE Interim Report

K. H. Lee, J. J. Nitao, and A. Kulshrestha Oct. 1993 80 p

(Contract W-7405-eng-48)

(DE94-005650; UCRL-ID-113521) Avail: CASI HC A05/MF A01

This interim report presents results of work completed in the ongoing verification and benchmark testing of the NUFT (Nonisothermal Unsaturated-saturated Flow and Transport) computer code. NUFT is a suite of multiphase, multicomponent models for numerical solution of thermal and isothermal flow and transport in porous media, with application to subsurface contaminant transport problems. The code simulates the coupled transport of heat, fluids, and chemical components, including volatile organic compounds. Grid systems may be cartesian or cylindrical, with one-, two-, or fully three-dimensional configurations possible. In this initial phase of testing, the NUFT code was used to solve seven one-dimensional unsaturated flow and heat transfer problems. Three verification and four benchmarking problems were solved. In the verification testing, excellent agreement was observed between NUFT results and the analytical or quasianalytical solutions. In the benchmark testing, results of code intercomparison were very satisfactory. From these testing results, it is concluded that the NUFT code is ready for application to field and laboratory problems similar to those addressed here. Multidimensional problems, including those dealing with chemical transport, will be addressed in a subsequent report. DOE

N94-34171*# Calspan-State Univ. of New York Joint Venture, Buffalo, NY. Research Center.

EXPERIMENTAL STUDIES OF SHOCK-WAVE/WALL-JET INTERACTION IN HYPERSONIC FLOW Final Report

Michael S. Holden and Kathleen Rodriguez May 1994 225 p

(Grant NAG1-790)

(NASA-CR-195844; NAS 1.26:195844) Avail: CASI HC A10/MF A03

Experimental studies have been conducted to examine slot film cooling effectiveness and the interaction between the cooling film and an incident planar shock wave in turbulent hypersonic flow. The experimental studies were conducted in the 48-inch shock tunnel at Calspan at a freestream Mach number of close to 6.4 and at a Reynolds number of 35 x 10(exp 6) based on the length of the model at the injection point. The Mach 2.3 planar wall jet was generated from 40 transverse nozzles (with heights of both 0.080 inch and 0.120 inch), producing a film that extended the full width of the model. The nozzles were operated at pressures and velocities close to matching the freestream, as well as at conditions where the nozzle flows were over- and under-expanded. A two-dimensional shock generator was used to generate oblique shocks that deflected the flow through total turnings of 11, 16, and 21 degrees; the flows impinged downstream of the nozzle exits. Detailed measurements of heat transfer and pressure were made both ahead and downstream of the injection station, with the greatest concentration of measurements in the regions of shock-wave/boundary layer interaction. The major objectives of these experimental studies were to explore the effectiveness of film cooling in the presence of regions of shock-wave/boundary layer interaction and, more specifically, to determine how boundary layer separation and the large recompression heating rates were modified by film cooling. Detailed distributions of heat transfer and pressure were obtained in the incident shock/wall-jet interaction region for a series of shock strengths and impingement positions for each of the two nozzle heights. Measurements were also made to examine the effects of nozzle lip thickness on cooling effectiveness. The major conclusion from these studies was that the effect of the cooling film could be readily dispersed by relatively weak incident shocks, so the peak heating in the recompression region was not significantly reduced by even the largest levels of film cooling. For the case studies in the absence of film cooling, the interaction regions were unseparated. However, adding film cooling resulted in regions of boundary layer separation induced in the film cooling layer -- the size of which regions first increased and then decreased with increased film cooling. Surprisingly, the size of the separated regions and the magnitude of the recompression heating were not strongly influenced by the thickness of the cooling film, nor by the point of shock impingement relative to the exit plane of the nozzles. The lip thickness was found to have little effect on cooling effectiveness. Measurements with and in the absence of shock interaction were compared with the results of earlier experimental studies and correlated in terms of the major parameters controlling these flows. Author

N94-34259*# Bionetics Corp., Hampton, VA.

A COMPUTER PROGRAM FOR CONDENSING HEAT EXCHANGER PERFORMANCE IN THE PRESENCE OF NONCONDENSABLE GASES

Boris Yendler Jun. 1994 20 p

(Contract NAS2-13273)

(NASA-CR-177643; A-94097; NAS 1.26:177643) Avail: CASI HC A03/MF A01

A computer model has been developed which evaluates the performance of a heat exchanger. This model is general enough to be used to evaluate many heat exchanger geometries and a number of different operating conditions. The film approach is used to describe condensation in the presence of noncondensables. The model is also easily expanded to include other effects like fog formation or suction. Author

N94-34300*# North Carolina State Univ., Raleigh, NC. Dept. of Mechanical and Aerospace Engineering.

SEMI-SPAN MODEL TESTING IN THE NATIONAL TRANSONIC FACILITY Semiannual Status Report

Ndaona Chokani May 1994 21 p

(Contract NCC1-169)

(NASA-CR-195952; NAS 1.26:195952) Avail: CASI HC A03/MF A01

The present work was motivated by an ongoing research program at NASA Langley Research Center to develop a semi-span testing capability for the National Transonic Facility (NTF). This test technique is being investigated as a means to design and optimize high-lift devices at flight Reynolds numbers in a ground test facility. Even though the freestream Mach numbers of interest are around .20, the flow around a transport wing with high lift devices deployed may contain regions of compressible flow. Thus to properly model the flow physics, a compressible flow solver may be required. However, the application of a compressible flow solver at low Mach numbers can be problematic. The objective of this phase of the project is to directly compare the performance of two widely used three-dimensional compressible Navier-Stokes solvers at low Mach numbers to both experimental data and to results obtained from an incompressible Navier-Stokes solver. The geometries of interest are two isolated wings with different leading edge sweep angles. The compressible Navier-Stokes solvers chosen, TLNS3D-MB and CFL3D, which were developed at NASA Langley Research Center (LaRC), represent the current state-of-the-art in

compressible 3-D Navier-Stokes solvers. The incompressible Navier-Stokes solver, INS3D-UP, developed recently at NASA Ames Research Center (ARC), represents the current state-of-the-art in incompressible Navier-Stokes solvers. Derived from text

N94-34394*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
A PHASE EQUATION APPROACH TO BOUNDARY LAYER INSTABILITY THEORY: TOLLMIEN SCHLICHTING WAVES Final Report
Philip Hall Apr. 1994 39 p Submitted for publication
(Contract NAS1-19480; NSF CTS-91-23553; RTOP 505-90-52-01)
(NASA-CR-194901; NAS 1.26:194901; ICASE-94-23) Avail: CASI HC A03/MF A01

Our concern is with the evolution of large amplitude Tollmien-Schlichting waves in boundary layer flows. In fact the disturbances we consider are of a comparable size to the unperturbed state. We shall describe two-dimensional disturbances which are locally periodic in time and space. This is achieved using a phase equation approach of the type discussed by Howard and Kopell (1977) in the context of reaction-diffusion equations. We shall consider both large and O(1) Reynolds numbers flows though, in order to keep our asymptotics respectable, our finite Reynolds number calculation will be carried out for the asymptotic suction flow. Our large Reynolds number analysis, though carried out for Blasius flow, is valid for any steady two-dimensional boundary layer. In both cases the phase equation approach shows that the wavenumber and frequency will develop shocks or other discontinuities as the disturbance evolves. As a special case we consider the evolution of constant frequency/wavenumber disturbances and show that their modulational instability is controlled by Burgers equation at finite Reynolds number and by a new integrodifferential evolution equation at large Reynolds numbers. For the large Reynolds number case the evolution equation points to the development of a spatially localized singularity at a finite time. The three-dimensional generalizations of the evolution equations is also given for the case of weak spanwise modulations. Author

N94-34680*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
THE EFFECT OF CROSSFLOW ON GOERTLER VORTICES Final Report
S. R. Otto (Birmingham Univ., England.) and James P. Denier (New South Wales Univ., Kensington, Australia.) Mar. 1994 31 p Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194897; NAS 1.26:194897; ICASE-94-19) Avail: CASI HC A03/MF A01

It is well known that the boundary layer flow over a surface with a region of concave curvature is susceptible to centrifugal instabilities in the form of Gortler vortices. In the limit of large Gortler number (a parameter which is a measure of the curvature of the surface) the effect of a crossflow component in the underlying basic flow has been shown to stabilize these modes and thus render the Gortler vortex mechanism inoperable in these situations. Here we consider the effect of crossflow when the Gortler number (and the scaled spanwise wavenumber of the vortex) are both order one quantities. The parabolic partial differential equations governing the linear evolution of a Gortler vortex in a three-dimensional boundary layer are solved numerically. Our results suggest that, at least for small magnitude crossflows, the Gortler vortex instability mechanism is still operable. In addition we consider the effect of an applied pressure gradient within the boundary layer on the instability mechanism and demonstrate that a favorable pressure gradient renders the boundary layer more susceptible to the Gortler vortex instability; this is in stark contrast to the case of Tollmien-Schlichting waves where a favorable pressure gradient stabilizes the flow. Author

N94-34686*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
NUMERICAL SIMULATION OF TWO-DIMENSIONAL SPATIALLY-DEVELOPING MIXING LAYERS Final Report
R. V. Wilson (Old Dominion Univ., Norfolk, VA.) and A. O. Demuren (Old Dominion Univ., Norfolk, VA.) May 1994 45 p Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194911; NAS 1.26:194911; ICASE-94-32) Avail: CASI HC A03/MF A01

Two-dimensional, incompressible, spatially developing mixing layer simulations are performed at Re = 10(exp 2) and 10(exp 4) with two classes of perturbations applied at the inlet boundary; combinations of discrete modes from linear stability theory, and a broad spectrum of modes derived from experimentally measured velocity spectra. The effect of the type and strength of inlet perturbations on vortex dynamics and time-averaged properties are explored. Two-point spatial velocity and autocorrelations are used to estimate the size and lifetime of the resulting coherent structures and to explore possible feedback effects. The computed time-averaged properties such as mean velocity profiles, turbulent statistics, and spread rates show good agreement with experimentally measured values. It is shown that by forcing with a broad spectrum of modes derived from an experimental energy spectrum many experimentally observed phenomena can be reproduced by a 2-D simulation. The strength of the forcing merely affected the length required for the dominant coherent structures to become fully-developed. Thus intensities comparable to those of the background turbulence in many wind tunnel experiments produced the same results, given sufficient simulation length. Author

N94-34721*# Washington Univ., Saint Louis, MO.
COMBINED LAURA-UPS SOLUTION PROCEDURE FOR CHEMICALLY-REACTING FLOWS M.S. Thesis
William A. Wood 6 Jun. 1994 78 p
(NASA-TM-107964; NAS 1.15:107964) Avail: CASI HC A05/MF A01

A new procedure seeks to combine the thin-layer Navier-Stokes solver LAURA with the parabolized Navier-Stokes solver UPS for the aerothermodynamic solution of chemically-reacting air flowfields. The interface protocol is presented and the method is applied to two slender, blunted shapes. Both axisymmetric and three dimensional solutions are included with surface pressure and heat transfer comparisons between the present method and previously published results. The case of Mach 25 flow over an axisymmetric six degree sphere-cone with a noncatalytic wall is considered to 100 nose radii. A stability bound on the marching step size was observed with this case and is attributed to chemistry effects resulting from the noncatalytic wall boundary condition. A second case with Mach 28 flow over a sphere-cone-cylinder-flare configuration is computed at both two and five degree angles of attack with a fully-catalytic wall. Surface pressures are seen to be within five percent with the present method compared to the baseline LAURA solution and heat transfers are within 10 percent. The effect of grid resolution is investigated and the nonequilibrium results are compared with a perfect gas solution, showing that while the surface pressure is relatively unchanged by the inclusion of reacting chemistry the nonequilibrium heating is 25 percent higher. The procedure demonstrates significant, order of magnitude reductions in solution time and required memory for the three dimensional case over an all thin-layer Navier-Stokes solution. Author

N94-34916*# Sverdrup Technology, Inc., Brook Park, OH.
EQUATIONS FOR ESTIMATING THE STRENGTH OF TV SIGNALS SCATTERED BY WIND TURBINES Final Report
David A. Spera and Dipak L. Sengupta May 1994 33 p
(Contract NAS3-25266; RTOP 505-63-5B)
(NASA-CR-194468; E-8579; NAS 1.26:194468) Avail: CASI HC A03/MF A01

During the late 1970's and early 1980's, concerns about the potential interference of wind turbine generators with electromagnetic communication signals led to a series of research studies, both in the laboratory and in the field, conducted by the staff of the University of Michigan Radiation Laboratory. These studies were sponsored by organizations such as the U.S. Department of Energy, the Solar Energy Research Institute, and private developers of wind power stations. Research objectives were to identify the mechanisms by which wind turbines might adversely affect communication signals, estimate the severity of these effects for different types of signals (e.g. television, radio, microwave, and navigation), and formulate mathematical models with which to predict the sizes of potential interference zones around wind turbines and wind power plants. This work formed the basis for preliminary standards on assessing electromagnetic interference (EMI) by wind turbines. With the current renewal of interest in wind energy projects, it is appropriate that the many experimental and analytical aspects of this pioneering work be reviewed and correlated. The

purpose of this study is to combine test data and theory from previously published and unpublished research reports into a unified and consistent set of equations which are useful for estimating potential levels of television interference from wind turbines. To be comprehensive, these equations will include both horizontal-axis and vertical-axis wind turbines (HAWT's and VAWT's), blade configuration parameters (e.g. number, size, material, twist, and coning), signal frequency and power, and directional characteristics of the receiving antenna. The approach that is followed in this report is as follows. First, some basic equations that describe electromagnetic signals with interference are presented without detailed derivations, since the latter are available in the references. Minor changes in terminology are made for purposes of consistency. Next, the concept of a signal scatter ratio is introduced, which defines the fraction of the signal impinging on a wind turbine that is scattered by its blades onto a nearby receiver. Equations from references are modified for the calculation of experimental scatter ratios (from measured signals containing interference) and idealized scatter ratios (from rotor characteristics and relative locations of the transmitter, the turbine, and the receiver). Experimental and idealized scatter ratios are then calculated and compared for 75 cases from the literature, in which TVI measurements were made around a variety of wind turbines. An empirical equation is then defined for estimating the probability that an actual scatter ratio will differ from an idealized ratio by a given amount. Finally a sample calculation of the size of a potential TV interference zone around a hypothetical wind power station is presented. Author

N94-34917*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

DIRECT SIMULATION OF A SELF-SIMILAR PLANE WAKE

Robert D. Moser and Michael M. Rogers Apr. 1994 11 p
(RTOP 505-59-50)
(NASA-TM-108815; A-94070; NAS 1.15:108815) Avail: CASI HC A03/MF A01

Direct simulations of two time-developing turbulent wakes have been performed. Initial conditions for the simulations were obtained from two realizations of a direct simulation of a turbulent boundary layer at momentum thickness Reynolds number 670. In addition, extra two dimensional disturbances were added in one of the cases to mimic two dimensional forcing. The unforced wake is allowed to evolve long enough to attain self similarity. The mass-flux Reynolds number (equivalent to the momentum thickness Reynolds number in spatially developing wakes) is 2000, which is high enough for a short k(exp -5/3) range to be evident in the streamwise one dimensional velocity spectrum. Several turbulence statistics have been computed by averaging in space and over the self-similar period in time. The growth rate in the unforced flow is low compared to experiments, but when this growth-rate difference is accounted for, the statistics of the unforced case are in reasonable agreement with experiments. However, the forced case is significantly different. The growth rate, turbulence Reynolds number, and turbulence intensities are as much as ten times larger in the forced case. In addition, the forced flow exhibits large-scale structures similar to those observed in transitional wakes, while the unforced flow does not. Author (revised)

N94-34949*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

A FAST NUMERICAL SOLUTION OF SCATTERING BY A CYLINDER: SPECTRAL METHOD FOR THE BOUNDARY INTEGRAL EQUATIONS
Final Report

Fang Q. Hu (Old Dominion Univ., Norfolk, VA.) May 1994 36 p
Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194918; NAS 1.26:194918; ICASE-94-36) Avail: CASI HC A03/MF A01

It is known that the exact analytic solutions of wave scattering by a circular cylinder, when they exist, are not in a closed form but in infinite series which converges slowly for high frequency waves. In this paper, we present a fast number solution for the scattering problem in which the boundary integral equations, reformulated from the Helmholtz equation, are solved using a Fourier spectral method. It is shown that the special geometry considered here allows the implementation of the spectral method to be simple and very efficient. The present method differs from previous approaches in that the singularities of the integral kernels are removed and dealt with accurately. The proposed method preserves the spectral accuracy and is shown to have an exponential rate of convergence. Aspects of efficient implementation using FFT are discussed. Moreover, the boundary integral equations of combined single and double-layer representation are used in the present paper. This ensures the uniqueness of the numerical solution for the scattering problem at all frequencies. Although a strongly singular kernel is encountered for the Neumann boundary conditions, we show that the hypersingularity can be handled easily in the spectral method. Numerical examples that demonstrate the validity of the method are also presented. Author

N94-34966*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

PHYSICS OF FORCED UNSTEADY SEPARATION

Lawrence W. Carr, ed. Mar. 1992 328 p Workshop held in Moffett Field, CA; sponsored by AFOSR and ARO
(RTOP 505-59-53)
(NASA-CP-3144; A-91055; NAS 1.55:3144) Avail: CASI HC A15/MF A03

This report contains the proceedings of a workshop held at NASA Ames Research Center in April 1990. This workshop was jointly organized by NASA, the Air Force Office of Scientific Research (AFOSR), and the Army Research Office (ARO), and was directed toward improved understanding of the physical processes that cause unsteady separation to occur. The proceedings contain the written contributions for the workshop, and include selected viewgraphs used in the various presentations. For individual titles, see N94-34967 through N94-34989.

N94-34967*# United Technologies Corp., East Hartford, CT.

UNSTEADY SEPARATION EXPERIMENTS ON 2-D AIRFOILS, 3-D WINGS, AND MODEL HELICOPTER ROTORS **c02**

Peter F. Lorber and Franklin O. Carta *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 1-22
(For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

Information on unsteady separation and dynamic stall is being obtained from two experimental programs that have been underway at United Technologies Research Center since 1984. The first program is designed to obtain detailed surface pressure and boundary layer condition information during high amplitude pitching oscillations of a large (17.3 in. chord) model wing in a wind tunnel. The second program involves the construction and testing of a pressure-instrumented model helicopter rotor. This presentation describes some of the results of these experiments, and in particular compares the detailed dynamic stall inception information obtained from the oscillating wing with the unsteady separation and reverse flow results measured on the retreating blade side of the model rotor during wind tunnel testing. Derived from text

N94-34968*# Naval Postgraduate School, Monterey, CA. Dept. of Aeronautics and Astronautics.

COMPARISON OF PITCH RATE HISTORY EFFECTS ON DYNAMIC STALL **c05**

M. S. Chandrasekhara, Lawrence W. Carr, and S. Ahmed *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 23-34 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

Dynamic stall of an airfoil is a classic case of forced unsteady separated flow. Flow separation is brought about by large incidences introduced by the large amplitude unsteady pitching motion of an airfoil. One of the parameters that affects the dynamic stall process is the history of the unsteady motion. In addition, the problem is complicated by the effects of compressibility that rapidly appear over the airfoil even at low Mach numbers at moderately high angles of attack. Consequently, it is of interest to know the effects of pitch rate history on the dynamic stall process. This abstract compares the results of a flow visualization study of the problem with two different pitch rate histories, namely, oscillating airfoil motion and a linear change in the angle of attack due to a transient pitching motion.
Derived from text

N94-34969*# Florida Agricultural and Mechanical Univ., Tallahassee, FL. Coll. of Engineering.

UNSTEADY FLOW PAST AN AIRFOIL PITCHED AT CONSTANT RATE **c02**

L. Lourenco, L. VanDommelen, C. Shib, and A. Krothapalli *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 35-59 Sponsored by AFOSR Prepared in cooperation with Florida State Univ., Tallahassee (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The unsteady flow past a NACA 0012 airfoil that is undertaking a constant-rate pitching up motion is investigated experimentally by the PIDV technique in a water towing tank. The Reynolds number is 5000, based upon the airfoil's chord and the free-stream velocity. The airfoil is pitching impulsively from 0 to 30 deg. with a dimensionless pitch rate alpha of 0.131. Instantaneous velocity and associated vorticity data have been acquired over the entire flow field. The primary vortex dominates the flow behavior after it separates from the leading edge of the airfoil. Complete stall emerges after this vortex detaches from the airfoil and triggers the shedding of a counter-rotating vortex near the trailing edge. A parallel computational study using the discrete vortex, random walk approximation has also been conducted. In general, the computational results agree very well with the experiment. Author

N94-34970*# University of Southern California, Los Angeles, CA. Dept. of Aerospace Engineering.
UNSTEADY SEPARATION PROCESS AND VORTICITY BALANCE ON UNSTEADY AIRFOILS c02
Chih-Ming Ho, Ismet Gursul, Chiang Shih, and Hank Lin *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 61-77 (For primary document see N94-34966 10-34)
(Contract F49620-88-C-0061)
Avail: CASI HC A03/MF A03

Low momentum fluid erupts at the unsteady separation region and forms a local shear layer at the viscous-inviscid interface. At the shear layer, the vorticity lumps into a vortex and protrudes into the inviscid region. This process initiates the separation process. The response of airfoils in unsteady free stream was investigated based on this vortex generation and convection concept. This approach enabled us to understand the complicated unsteady aerodynamics from a fundamental point of view. Author

N94-34971*# Lehigh Univ., Bethlehem, PA.
CONTROL OF LEADING-EDGE VORTICES ON A DELTA WING c02
C. Magness, O. Robinson, and D. Rockwell *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 79-100 Sponsored by AFOSR (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The unsteady flow structure of leading-edge vortices on a delta wing has been investigated using new types of experimental techniques, in order to provide insight into the consequences of various forms of active control. These investigations involve global control of the entire wing and local control applied at crucial locations on or adjacent to the wing. Transient control having long and short time-scales, relative to the convective time-scale C/U(sub infinity), allows substantial modification of the unsteady and time-mean flow structure. Global control at long time-scale involves pitching the wing at rates an order of magnitude lower than the convective time-scale C/U(sub infinity), but at large amplitudes. The functional form of the pitching maneuver exerts a predominant influence on the trajectory of the feeding sheet, the instantaneous vorticity distribution, and the instantaneous location of vortex breakdown. Global control at short time-scales of the order of the inherent frequency of the shear layer separating from the leading-edge and the natural frequency of vortex breakdown shows that 'resonant' response of the excited shear layer-vortex breakdown system is attainable. The spectral content of the induced disturbance is preserved not only across the entire core of the vortex, but also along the axis of the vortex into the region of vortex breakdown. This unsteady modification results in time-mean alteration of the axial and swirl velocity fields and the location of vortex breakdown. Localized control at long and short time-scales involves application of various transient forms of suction and blowing using small probes upstream and downstream of the location of vortex breakdown, as well as distributed suction and blowing along the leading-edge of the wing applied in a direction tangential to the feeding sheet. These local control techniques can result in substantial alteration of the location of vortex breakdown; in some cases, it is possible to accomplish this without net mass addition to the flow field. Derived from text

N94-34972*# Illinois Inst. of Tech., Chicago, IL. Fluid Dynamics Research Center.
THE UNSTEADY PRESSURE FIELD AND VORTICITY PRODUCTIION AT THE SUCTION SURFACE OF A PITCHING AIRFOIL c02
Mukund Acharya and Metwally H. Metwally *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 101-118 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The objective of this work is to develop techniques for the control and management of separated flows over airfoils, particularly under unsteady operating conditions. The results are expected to help achieve the ultimate goal, which is flow management for highly maneuverable aircraft. Author

N94-34973*# Colorado Univ., Boulder, CO. Dept. of Aerospace Engineering Sciences.
INVESTIGATION OF MECHANISMS FOR VORTICITY GENERATION AND FLOW SEPARATION ON BODIES IN UNSTEADY MOTION
Chuen-Yen Chow and Kai-Hsiung Kao *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 119-127 (For primary document see N94-34966 10-34)
(Contract F49620-88-C-0098)
Avail: CASI HC A02/MF A03

Described in this work is an attempt to identify and examine the mechanisms responsible for the generation/shedding of vorticities and the separation of flow from bodies in forced unsteady motions through a viscous fluid. To gain insight into the basic physics of unsteady fluid dynamics, possible mechanisms are isolated and examined separately by assuming different simplified flow arrangements. Even without depending on the availability of the supercomputers, it might be possible to explain or predict some complex unsteady flow phenomena based on the fundamental understanding of the individual mechanisms. Author

N94-34974*# Cincinnati Univ., OH. Dept. of Aerospace Engineering and Engineering Mechanics.
CHARACTERIZATION OF DYNAMIC STALL PHENOMENON USING TWO-DIMENSIONAL UNSTEADY NAVIER-STOKES EQUATIONS c02
K. N. Ghia, U. Ghia, and G. A. Osswald *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 129-147 (For primary document see N94-34966 10-34)
(Grants AF-AFOSR-0074-87; AF-AFOSR-0249-90)
Avail: CASI HC A03/MF A03

Among the new significant aspects of the present work are: (1) the treatment of the far-field boundary; (2) the use of C-grid topology, with the branch-cut singularity treated analytically; (3) evaluation of the effect of the envelope of prevailing initial states, and finally; (4) the ability to employ streakline/pathline 'visualization' to probe the unsteady features prevailing in vortex-dominated flows. The far-field boundary is placed at infinity, using appropriate grid stretching. This contributes to the accuracy of the solutions, but raised a number of important issues which needed to be resolved; this includes determining the equivalent time-dependent circulation for the pitching airfoil. A secondary counter-clockwise vortex erupts from within the boundary layer and immediately pinches off the energetic leading-edge shear layer which then, through hydrodynamic instability, rolls up into the dynamic stall vortex. The streakline/pathline visualization serves to provide information for insight into the physics of the unsteady separated flow. Author

N94-34975*# Arizona Univ., Tucson, AZ.
COMPUTED UNSTEADY FLOWS OF AIRFOILS AT HIGH INCIDENCE c02
K.-Y. Fung, Jeffrey Currier, and S. O. Man *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 149-162 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The flow over an airfoil at an angle of attack above the static stall angle would ordinarily be massively separated. Under dynamic conditions, the onset of stall can be delayed to an angle, depending on the type of unsteadiness, much higher than that for static stall. The stall onset mechanisms under dynamic conditions are unclear. Due to extreme difficulties

involved, experimental investigations, so far, have provided insufficient information about the flow field for the identification of the onset mechanisms. A course of classical boundary layer analysis augmented with numerical experiments and measured data is chosen here instead, with the hope that the identification of onset mechanisms can be more systematic and quantitative. Author

N94-34976*# Lockheed Missiles and Space Co., Sunnyvale, CA.
WILL THE REAL DYNAMIC INSTABILITY MECHANISM PLEASE BE RECOGNIZED!
L. E. Ericsson *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 163-175 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

There is a richness of flow mechanisms that can cause dynamic instability. Only after asking the right questions and carefully considering the answers can the fluid dynamic source of the observed dynamic instability be recognized. This is illustrated by two carefully chosen examples. Author

N94-34977*# Naval Postgraduate School, Monterey, CA. Dept. of Aeronautics and Astronautics.
COMPUTATION OF UNSTEADY FLOWS OVER AIRFOILS **c02**
J. A. Ekaterinaris and M. F. Platzer *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 177-185 Sponsored by Naval Air Systems Command (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

Two methods are described for calculating unsteady flows over rapidly pitching airfoils. The first method is based on an interactive scheme in which the inviscid flow is obtained by a panel method. The boundary layer flow is computed by an interactive method that makes use of the Hilbert integral to couple the solutions of the inviscid and viscous flow equations. The second method is based on the solution of the compressible Navier-Stokes equations. The solution of these equations is obtained with an approximately factorized numerical algorithm, and with single block or multiple grids which enable grid embedding to enhance the resolution at isolated flow regions. In addition, the attached flow region can be computed by the numerical solution of compressible boundary layer equations. Unsteady pressure distributions obtained with both methods are compared with available experimental data. Derived from text

N94-34978*# California State Univ., Long Beach, CA. Dept. of Aerospace Engineering.
PREDICTION OF UNSTEADY AIRFOIL FLOWS AT LARGE ANGLES OF INCIDENCE **c02**
Tuncer Cebeci, H. M. Jang, and H. H. Chen *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 187-201 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The effect of the unsteady motion of an airfoil on its stall behavior is of considerable interest to many practical applications including the blades of helicopter rotors and of axial compressors and turbines. Experiments with oscillating airfoils, for example, have shown that the flow can remain attached for angles of attack greater than those which would cause stall to occur in a stationary system. This result appears to stem from the formation of a vortex close to the surface of the airfoil which continues to provide lift. It is also evident that the onset of dynamic stall depends strongly on the airfoil section, and as a result, great care is required in the development of a calculation method which will accurately predict this behavior. Author (revised)

N94-34979*# Lehigh Univ., Bethlehem, PA. Dept. of Mechanical Engineering and Mechanics.
SOME ASPECTS OF UNSTEADY SEPARATION **c02**
C. R. Smith and J. D. A. Walker *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 203-208 (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

Unsteady separation can be forced in a variety of ways and in this presentation two fundamental means will be considered: (1) the introduction of convected vorticular disturbances into the flow; and (2) the influence of a specific type of three-dimensional geometry. In both situations a response of the viscous flow near the wall is provoked wherein the fluid near the surface abruptly focuses into a narrow region that erupts from the surface into the mainstream. In two-dimensional flows, the eruption takes the form of a narrow, explosively-growing spike, while in three-dimensional situations, examples are presented which indicate that the eruption is along a narrow zone in the shape of a crescent-shaped plume. The nature of the three-dimensional flow near a circular cylinder, which is mounted normal to a flat plate, is also examined in this study. Here the three-dimensional geometry induces complex three-dimensional separations periodically. The dynamics of the generation process is studied experimentally in a water channel using hydrogen bubble wires and a laser sheet, and the main features of the laminar regime through to transition are documented. Author (revised)

N94-34980*# United Technologies Research Center, East Hartford, CT.
DEPARTURE SOLUTIONS OF THE UNSTEADY THIN-LAYER AND FULL NAVIER-STOKES EQUATIONS SOLVED USING STREAMLINE CURVATURE BASED ITERATION TECHNIQUES
M. Barnett, D. Turner, and A. P. Rothmayer *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 209-218 Sponsored in part by NSF (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

The development of a thorough understanding of the mechanisms for vortex eruptions from viscous layers, which are believed to be associated with phenomena such as dynamic stall onset and transition, is crucial if accurate models of such phenomena are to be formulated. The development of such models may, in turn, allow for the possibility that such effects could be accounted for during the design of various aerodynamic devices such as wings, helicopter rotors, and turbomachinery blading and thus lead to designs which are stall free or stall resistant and which have better stall-recovery properties. The present investigation is being conducted as part of an effort to develop analytical and numerical tools which can be used to help improve our understanding of the vortex-eruption mechanism at high Reynolds numbers. The addition of the normal-momentum equation to the classical unsteady boundary-layer equations is crucial according to recent asymptotic analyses of the vortex-eruption problem and is a key feature of the analyses being developed by the present authors. The purpose of this paper is as follows: to describe departure solution behavior observed when using unsteady, streamline-curvature based solution procedures in which nontrivial transverse pressure gradient effects are included; and to show that special treatment of the time-derivative of the normal velocity is needed to eliminate the ill-posed solution behavior, which is observed when small spatial and temporal step sizes are used. Author (revised)

N94-34981*# Stanford Univ., CA. Dept. of Mechanical Engineering.
EXPERIMENTS ON AN UNSTEADY, THREE-DIMENSIONAL SEPARATION
R. W. Henk, W. C. Reynolds, and H. L. Reed *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 219-228 (For primary document see N94-34966 10-34)
(Contract N00014-84-K-0232)
Avail: CASI HC A02/MF A03

Unsteady, three-dimensional flow separation occurs in a variety of technical situations including turbomachinery and low-speed aircraft. An experimental program at Stanford in unsteady, three-dimensional, pressure-driven laminar separation has investigated the structure and time-scaling of these flows; of particular interest is the development, washout, and control of flow separation. Results reveal that a two-dimensional, laminar boundary layer passes through several stages on its way to a quasi-steady three-dimensional separation. The quasi-steady state of the separation embodies a complex, unsteady, vortical structure. Author (revised)

N94-34982*# Iowa State Univ. of Science and Technology, Ames, IA. Dept. of Aerospace Engineering.
NON-LOCAL SUB-CHARACTERISTIC ZONES OF INFLUENCE IN UNSTEADY INTERACTIVE BOUNDARY-LAYERS
A. P. Rothmayer *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 229-237 Sponsored by United Technologies Research Center and NSF (For primary document see

N94-34966 10-34)
Avail: CASI HC A02/MF A03

The properties of incompressible, unsteady, interactive, boundary layers are examined for a model hypersonic boundary layer and internal flow past humps or, equivalently, external flow past short-scaled humps. Using a linear high frequency analysis, it is shown that the domains of dependence within the viscous sublayer may be a strong function of position within the sublayer and may be strongly influenced by the pressure displacement interaction, or the prescribed displacement condition. Detailed calculations are presented for the hypersonic boundary layer. This effect is found to carry over directly to the fully viscous problem as well as the nonlinear problem. In the fully viscous problem, the non-local character of the domains of dependence manifests itself in the sub-characteristics. Potential implications of the domain of dependence structure on finite difference computations of unsteady boundary layers are briefly discussed.

Author (revised)

N94-34983*# Michigan Univ., Ann Arbor, MI. Dept. of Mechanical Engineering and Applied Mechanics.

FORCED UNSTEADY DECELERATION OF A TURBULENT BOUNDARY LAYER FROM A TEMPORAL PERSPECTIVE

G. J. Brereton *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 239-250 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The behavior of a turbulent boundary layer which has been subjected to a local ramp-like deceleration in the external velocity field, which leads to forced separation, has been studied experimentally. The data of this study are re-interpreted in light of more recent findings concerning the temporal nature of boundary layer turbulence in the presence of forced unsteady shear. In particular, the robustness of the near-wall turbulent motions to organized deformation is recognized. Their resilence during unsteady shearing action promotes continued efficient turbulent mixing and rapid redistribution of turbulent kinetic energy during forced transients. In aerodynamic problems, the rapid nature of the adjustment of the turbulence field to a new temporal boundary condition necessitates equally rapid remedial measures to be taken if means of control/prevention of forced unsteady separation are to be deployed to maximum effect. This requirement suggests exploration of the use of simple, real-time statistical forecasting techniques, based upon time-series analysis of easily-measurable features of the flow, to help assure timely deployment of mechanisms of boundary-layer control. This paper focuses upon the nature of turbulence in boundary layers undergoing forced deceleration which would lead to separation. A preliminary form of a forecasting model is presented and evaluated. Using observations of the previous two large eddies passing a detector, it forecasts the behavior of the future large eddy rather well.

Author (revised)

N94-34984*# Stanford Univ., CA. Heat Transfer and Turbulence Mechanics Group.

TURBULENCE MODELLING FOR UNSTEADY SEPARATED FLOWS

Peter Bradshaw *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 251-268 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

The exact transport equations for turbulent (Reynolds) stresses have left-hand sides representing the 'substantial derivatives' of the Reynolds stresses, i.e., the rates of change of stress with respect to time, as seen by an observer following the mean motion of the fluid. Here the 'mean' is a statistical average for the turbulent motion, distinguished from the ordered unsteadiness on which it is superimposed: for a turbomachine blade or a cyclically-pitching airfoil, the mean is a phase average. Written in coordinates fixed with respect to a solid surface, the substantial derivative appears partly as an Eulerian time derivative at given spatial coordinate position and partly as a spatial derivative. Separation presents two specific problems to a turbulence model: (1) prediction of the flow near separation depends critically on the 'near-wall' part of the turbulence model, and (2) downstream of separation, a boundary layer changes gradually to a mixing layer.

Derived from text

N94-34985*# Cornell Univ., Ithaca, NY.

TOWARD THE OPTIMIZATION OF CONTROL OF UNSTEADY SEPARATION

S. F. Shen and Zheng-Hua Xiao *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 269-276 Sponsored by NSF; IBM; and Corporate Research Inst. (For primary document see N94-34966 10-34)
(Grant AF-AFOSR-0229-88)
Avail: CASI HC A02/MF A03

Regardless of our understanding of the complicated physical process, means can always be found to alter the occurrence and development of unsteady separation. To be able to optimize the control of separation, however, requires the identification of the critical aspects to which the intervention may be focused and achieve the desired result with minimum waste of effort. The Lagrangian analysis of unsteady boundary-layer traces the trajectories of individual fluid particles and reveals the 'bad seeds' that, through extreme deformation in the direction normal to the wall, eventually develop into a virtual barrier and cause the ejection of boundary-layer material into the main stream. It follows logically that separation can be triggered or delayed most effectively by targeting these 'bad seeds.' Since they are normally interior points of the boundary layer, attempts to influence them through the boundary conditions are necessarily indirect. Furthermore, as the strategy has to be the modification of the growing process of the 'bad seeds,' whatever may be the intervention scheme, it needs to be strong enough and early enough. In Shen and Wu, examples of how acceleration/deceleration of the two dimensional body, as well as the moving wall of a rotating cylinder, may affect the development of the bad seed toward separation are shown. In fact it was mentioned therein that the results might be the first step for a feasibility study of the control of unsteady separation. Presented are additional results of applying suction to an impulsively started circular cylinder.

Author (revised)

N94-34986*# Army Aviation Systems Command, Moffett Field, CA. Aeroflightdynamics Directorate.

THE QUEST FOR STALL-FREE DYNAMIC LIFT **c02**

C. Tung, K. W. McAlister, Lawrence W. Carr, E. Duque, and R. Zinner *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 277-295 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

During the past decade, numerous major effects have addressed the question of how to control or alleviate dynamic stall effects on helicopter rotors, but little concrete evidence of any significant reduction of the adverse characteristics of the dynamic stall phenomenon has been demonstrated. Nevertheless, it is important to remember that the control of dynamic stall is an achievable goal. Experiments performed at the US Army Aeroflight-dynamics Directorate more than a decade ago demonstrated that dynamic stall is not an unavoidable penalty of high amplitude motion, and that airfoils can indeed operate dynamically at angles far above the static-stall angle without necessarily forming a stall vortex. These experiments, one of them featuring a slat that was designed from static airfoil considerations, showed that unsteadiness can be a very beneficial factor in the development of high-lift devices for helicopter rotors. The experience drawn from these early experiments is now being focused on a program for the alleviation of dynamic-stall effects on helicopter rotors. The purpose of this effort is to demonstrate that rotor stall can be controlled through an improved understanding of the unsteady effects on airfoil stall and to document the role of specific means that lead to stall alleviation in the three dimensional unsteady environment of helicopter rotors in forward flight. The first concept to be addressed in this program will be a slatted airfoil. A two dimensional unsteady Navier-Stokes code has been modified to compute the flow around a two-element airfoil.

Derived from text

N94-34987*# Illinois Inst. of Tech., Chicago, IL. Fluid Dynamics Research Center.

MECHANISMS OF FLOW CONTROL WITH THE UNSTEADY BLEED TECHNIQUE **c02**

D. R. Williams, M. Acharya, and J. Bernhardt *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 297-307 (For primary document see N94-34966 10-34)
(Contract F49620-86-C-0133)
Avail: CASI HC A03/MF A03

The unsteady bleed technique (a.k.a. internal acoustic forcing) has

been shown to be an effective method for control of separation on low Reynolds number airfoils, blunt-end cylinders aligned axially with the flow, cylinders aligned perpendicular to the flow, and forebody geometries at high angles of attack. In many of these investigations, the mechanism for the control has been attributed to enhancement of the shear layer (Kelvin-Helmholtz) instability by the unsteady component of the forcing. However, this is not the only possible mechanism, nor may it be the dominant mechanism under some conditions. In this work it is demonstrated that at least two other mechanisms for flow control are present, and depending on the location and the amplitude of the forcing, these may have significant impact on the flow behavior. Experiments were conducted on a right-circular cylinder with a single unsteady bleed slot aligned along the axis of the cylinder. The effects of forcing frequency, forcing amplitude, and slot location on the azimuthal pressure distribution were studied. The results suggest that a strong vortical structure forms near the unsteady bleed slot when the slot location is upstream of the boundary layer separation point. The structure is unsteady, since it is created by the unsteady forcing. The 'vortex' generates a sizeable pressure spike (C(sub p) = -3.0) in the time-averaged pressure field immediately downstream of the slot. In addition to the pressure spike, the boundary layer separation location moves farther downstream when the forcing is activated. Delay of the separation is believed to be a result of enhancing the Kelvin-Helmholtz instability. When forcing is applied in a quiescent wind tunnel, a weak low-pressure region forms near the slot that is purely the result of the second-order streaming effect. Derived from text

N94-34988*# Colorado Univ., Boulder, CO.
CONCEPTS AND APPLICATION OF DYNAMIC SEPARATION FOR AGILITY AND SUPER-MANEUVERABILITY OF AIRCRAFT: AN ASSESSMENT **c05**
Peter Freymuth *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 309-316 (For primary document see N94-34966 10-34)
Avail: CASI HC A02/MF A03

Aims for improvement of fighter aircraft pursued by the unsteady flow community are high agility (the ability of the aircraft to make close turns in a low-speed regime) and super maneuverability (the ability of the aircraft to operate at high angles of attack in a post stall regime during quick maneuvers in a more extended speed range). High agility requires high lift coefficients at low speeds in a dynamic situation and this requirement can be met by dynamically forced separation or by quasistatic stall control. The competing methods will be assessed based on the known physics. Maneuvering into the post stall regime also involves dynamic separation but because even fast maneuvers involving the entire aircraft are 'aerodynamically slow' the resulting dynamic vortex structures should be considered 'elicited' rather than 'forced.' More work seems to be needed in this area of elicited dynamic separation. Derived from text

N94-34989*# Michigan State Univ., East Lansing, MI.
EFFECT OF INITIAL ACCELERATION ON THE DEVELOPMENT OF THE FLOW FIELD OF AN AIRFOIL PITCHING AT CONSTANT RATE **c02**
M. M. Koochesfahani, V. Smiljanovski, and T. A. Brown *In* NASA. Ames Research Center, Physics of Forced Unsteady Separation Mar. 1992 p 317-332 (For primary document see N94-34966 10-34)
Avail: CASI HC A03/MF A03

We present results from a series of experiments where an airfoil is pitched at constant rate from 0 to 60 degrees angle of attack. It is well documented that the dynamic stall behavior of such an airfoil strongly depends on the nondimensional pitch rate K = dot-alpha C/(2U(sub infinity)), where C is the chord, dot-alpha the constant pitch rate, and U(sub infinity) the free stream speed. In reality, the actual motion of the airfoil deviates from the ideal ramp due to the finite acceleration and deceleration periods imposed by the damping of drive system and response characteristics of the airfoil. It is possible that the pitch rate alone may not suffice in describing the flow and that the details of the motion trajectory before achieving a desired constant pitch rate may also affect the processes involved in the dynamic stall phenomenon. The effects of acceleration and deceleration periods are investigated by systematically varing the acceleration magnitude and its duration through the initial acceleration phase to constant pitch rate. The magnitude and duration of deceleration needed to bring the airfoil motion to rest is similarly controlled. Derived from text

N94-35074* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ACTIVE THERMAL ISOLATION FOR TEMPERATURE RESPONSIVE SENSORS Patent
Scott D. Martinson, inventor (to NASA), David L. Gray, inventor (to NASA), Debra L. Carraway, inventor (to NASA), and Daniel C. Reda, inventor (to NASA) 17 May 1994 8 p Filed 2 Jan. 1992 Supersedes N92-29954 (30 - 20, p 3446)
(NASA-Case-LAR-14612-1; US-Patent-5,311,772;
US-Patent-Appl-SN-820431; US-Patent-Class-73-147;
US-Patent-Class-73-204.18; Int-Patent-Class-G01F-1/68;
Int-Patent-Class-G01M-9/11) Avail: US Patent and Trademark Office

The detection of flow transition between laminar and turbulent flow and of shear stress or skin friction of airfoils is important in basic research for validation of airfoil theory and design. These values are conventionally measured using hot film nickel sensors deposited on a polyimide substrate. The substrate electrically insulates the sensor and underlying airfoil but is prevented from thermally isolating the sensor by thickness constraints necessary to avoid flow contamination. Proposed heating of the model surface is difficult to control, requires significant energy expenditures, and may alter the basic flow state of the airfoil. A temperature responsive sensor is located in the airflow over the specified surface of a body and is maintained at a constant temperature. An active thermal isolator is located between this temperature responsive sensor and the specific surface of the body. The total thickness of the isolator and sensor avoid any contamination of the flow. The temperature of this isolator is controlled to reduce conductive heat flow from the temperature responsive sensor to the body. This temperature control includes (1) operating the isolator at the same temperature as the constant temperature of the sensor; and (2) establishing a fixed boundary temperature which is either less than or equal to, or slightly greater than the sensor constant temperature. The present invention accordingly thermally isolates a temperature responsive sensor in an energy efficient, controllable manner while avoiding any contamination of the flow.
Official Gazette of the U.S. Patent and Trademark Office

N94-34185*# Heriot-Watt Univ., Edinburgh (Scotland).
WHIRL MEASUREMENTS ON LEAKAGE FLOWS IN TURBOMACHINE MODELS
A. J. Addlesee, D. Altiparmak, and S. Pan *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 167-178 Sponsored in part by Weir Pumps Ltd. (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

N94-34191*# Bently Rotor Dynamics Research Corp., Minden, NV.
EXPERIMENTAL AND ANALYTICAL STUDY ON FLUID WHIRL AND FLUID WHIP MODES
Agnes Muszynska *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 277-291 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

N94-34368# Anhui Inst. of Optics and Fine Mechanics, Hefei (China).
COMPUTER ASSISTANT TEST AND CONSULTIVE SYSTEM FOR AIRCRAFT FLUID ELEMENT
Jin-Ru Liu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 268-270 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34447# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Inst. fuer Antriebstechnik.
FLOW FIELD ANALYSIS IN A HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSOR
H. Pak, H. Krain, and B. Hoffmann *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 12 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

N94-34448# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Turbomachinery Dept.
INVERSE DESIGN OF RADIAL FLOW IMPELLERS WITH PRESCRIBED VELOCITY AT HUB AND SHROUD
R. A. VandenBraembussche, A. Demeulenaere, and J. Borges *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

N94-34450# BMW Rolls-Royce AeroEngines G.m.b.H., Lohhoff (Germany).
AERODYNAMIC DESIGN AND INVESTIGATION OF A MIXED FLOW COMPRESSOR STAGE
Gernot Eisenlohr and Friedrich Wilhelm Benfer *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p Sponsored by BMFT (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

N94-34451# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Inst. fuer Antriebstechnik.
DESIGN AND ANALYSIS OF A HIGHLY LOADED TRANSONIC COMPRESSOR CASCADE
E. Nicke, W. Steinert, A. Weber, and H. Starken *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 14 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

N94-34462# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec).
NUMERICAL SIMULATION OF AIRFOIL FILM COOLING: A JET IN CROSSFLOW
H. J. Saabas and A. Riahi *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 13 p (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N94-33549# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.
THE RESOLVABILITY ELLIPSOID FOR SENSOR BASED MANIPULATION
Brad Nelson and Pradeep K. Khosla Oct. 1993 29 p
(Contract DAAL03-91-G-0272)
(AD-A277898; CMU-RI-TR-93-28) Avail: CASI HC A03/MF A01

This paper presents a new sensor placement measure called resolvability. This measure provides a technique for estimating the relative ability of various sensor systems, including single camera systems, stereo pairs, multi-baseline stereo systems, and three dimensional rangefinders, to accurately control visually manipulated objects. The measure also indicates the capability of a visual sensor to provide spatially accurate data on objects of interest. The term resolvability refers to the ability of a visual sensor to resolve object positions and orientations. Our main interest in resolvability is in determining the accuracy with which a manipulator being observed by a camera can visually servo an object to a goal position and orientation. The resolvability ellipsoid is introduced to illustrate the directional nature of resolvability, and can be used to direct camera motion and adjust camera intrinsic parameters in real-time so that the servoing accuracy of the visual servoing system improves with camera-lens motion. The Jacobian mapping from task space to sensor space is derived for a single camera system, a stereo pair with parallel optical axes, and a stereo pair with perpendicular optical axes. Resolvability ellipsoids based on these mappings for various sensor configurations are presented. Visual servoing experiments demonstrate that resolvability can be used to direct camera-lens motion in order to increase the ability of a visually servoed manipulator to precisely servo objects. DTIC

N94-33605*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CHARACTERISTICS OF VAPORIZING CRYOGENIC SPRAYS FOR ROCKET COMBUSTION MODELING
Robert D. Ingebo May 1994 11 p Proposed for presentation at the ASME International Joint Power Generation Conference, Phoeniz, AZ, 2-6 Oct. 1994; sponsored by ASME
(RTOP 505-62-52)
(NASA-TM-106615; E-8898; NAS 1.15:106615) Avail: CASI HC A03/MF A01

Experimental measurements of the volume-median drop diameter, Dv.5e, of vaporizing cryogenic sprays were obtained with a drop size measuring instrument developed at NASA Lewis Research Center. To demonstrate the effect of atomizing-gas properties on characteristic drop size, a two-fluid fuel nozzle was used to break up liquid-nitrogen, LN2, jets in high-velocity gasflows of helium argon and gaseous nitrogen, GN2. Also, in order to determine the effect of atomizing-gas temperature on specific surface-areas of LN2 sprays, drop size measurements were made at gas temperatures of 111 and 293 K. Author

N94-33940# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.
BASIC PRINCIPLES OF FLIGHT TEST INSTRUMENTATION ENGINEERING, VOLUME 1, ISSUE 2 [INTRODUCTION GENERALE AUX PRINCIPES DE BASE DE L'INSTRUMENTATION DES ESSAIS EN VOL]
Robert W. Borek, Sr., ed. (National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.) and A. Pool, ed. (National Aerospace Lab., Amsterdam, Netherlands.) Mar. 1994 295 p Flight Test Instrumentation Series
(AGARD-AG-160-Vol-1-Issue-2; ISBN-92-835-0731-2) Copyright Avail: CASI HC A13/MF A03

Volume 1 of the AG 300 series on 'Flight Test Instrumentation' gives a general introduction to the basic principles of flight test instrumentation. The other volumes in the series provide more detailed treatments of selected topics on flight test instrumentation. Volume 1, first published in 1974, has been used extensively as an introduction for instrumentation courses and symposia, as well as being a reference work on the desk of most flight test and instrumentation engineers. It is hoped that this second edition, fully revised, will be used with as much enthusiasm as the first edition. In this edition a flight test system is considered to include both the data collection and data processing systems. In order to obtain an optimal data flow, the overall design of these two subsystems must be carefully matched; the detail development and the operation may have to be done by separate groups of specialists. The main emphasis is on the large automated instrumentation systems used for the initial flight testing of modern military and civil aircraft. This is done because there, many of the problems, which are discussed here, are more critical. It does not imply, however, that smaller systems with manual data processing are no longer used. In general, the systems should be designed to provide the required results at the lowest possible cost. For many tests which require only a few parameters, relatively simple systems are justified, especially if no complex equipment is available to the user. Although many of the aspects discussed in this volume apply to both small and large systems, aspects of the smaller systems are mentioned only when they are of special interest. The volume has been divided into three main parts. Part 1 defines the main starting points for the design of a flight test instrumentation system, as seen from the points of view of the flight test engineer and the instrumentation engineer. In Part 2 the discussion is concentrated on those aspects which apply to each individual measuring channel, and in Part 3 the main emphasis is on the integration of the individual data channels into one data collection system and on those aspects of the data processing which apply to the complete system. Author (revised)

N94-33952*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A THEORY AND EXPERIMENTS FOR DETECTING SHOCK LOCATIONS
S. I. Hariharan (Akron Univ., OH.), D. K. Johnson (Akron Univ., OH.), and G. Adamovsky Jun. 1994 13 p Presented at the OE*LASE 1994 Symposium: Laser Applications in Combustion and Combustion Diagnostics 2, Los Angeles, CA, 25-26 Jan. 1994; sponsored by the Society of Photo-Optical Instrumentation Engineers

(Contract NCC3-283; RTOP 505-62-50)
(NASA-TM-106634; E-8935; NAS 1.15:106634) Avail: CASI HC A03/MF A01

In this paper we present a simplified one-dimensional theory for predicting locations of normal shocks in a converging diverging nozzle. The theory assumes that the flow is quasi one-dimensional and the flow is accelerated in the throat area. Optical aspects of the model consider propagation of electromagnetic fields transverse to the shock front. The theory consists of an inverse problem in which from the measured intensity it reconstructs an index of refraction profile for the shock. From this profile and the Dale-Gladstone relation, the density in the flow field is determined, thus determining the shock location. Experiments show agreement with the theory. In particular the location is determined within 10 percent of accuracy. Both the theoretical as well as the experimental results are presented to validate the procedures in this work. Author

N94-34073*# Datatape, Inc., Pasadena, CA.
MARSHALL SPACE FLIGHT CENTER HEAD DEVELOPMENT PROGRAM Final Report
Jim Harrer 15 Feb. 1994 28 p
(Contract NAS8-39407)
(NASA-CR-193944; NAS 1.26:193944) Avail: CASI HC A03/MF A01

This report summarizes the results of the candidate head evaluation for the new long-life magnetic head per the SOW of Contract No. NAS8-39407, MSFC Head Development Program. The original program plans were to test a candidate head, fabricate a new head, then qualify the new head. These activities were scheduled to be carried out between March 1993 and March 1994. The program was halted after the evaluation of the candidate head by NAS8-39407 Amendment No. 4. MSFC has provided and authorized the use the MARS-2000 SRB QUAL Recorder PN 10400-0677-801 - Serial Number 200004 (Datatape PN 591000 - Serial Number 1004), Reproduce Amplifier Module (RAM) Datatape PN 533040 - Serial Number 2006, associated cables, and magnetic tape on special SRB/DFI tapered reels to Datatape for this program. All the testing that has been done for the candidate head evaluation was done at Datatape's facility in Pasadena,CA. The testing was performed in a Class 100,000 particle counts clean room at ambient temperature, except for the thermal testing which was conducted in a different area at Datatape. The Performance Verification Test Procedure PVT-11004-4 (PVT) and Acceptance Test Procedure ATP-11004-09 (ATP) procedures were used when tests were conducted on the recorder. Derived from text

N94-34266*# Auburn Univ., AL. Coll. of Engineering.
CRYSTAL GROWTH FURNACE SAFETY SYSTEM VALIDATION Final Report
D. W. Mackowski, R. Hartfield, S. H. Bhavnani, and V. M. Belcher 4 Mar. 1994 133 p
(Contract NAS8-39131)
(NASA-CR-193964; NAS 1.26:193964) Avail: CASI HC A07/MF A02

The findings are reported regarding the safe operation of the NASA crystal growth furnace (CGF) and potential methods for detecting containment failures of the furnace. The main conclusions are summarized by ampoule leak detection, cartridge leak detection, and detection of hazardous species in the experiment apparatus container (EAC). Derived from text

N94-34681 Department of the Navy, Washington, DC.
INTEGRAL PRESSURE SENSOR Patent
Eric E. Seeley, inventor (to Navy) and Allan D. Jackson, inventor (to Navy) 8 Feb. 1994 7 p Filed 21 Sep. 1992
(AD-D016188; US-Patent-5,284,061; US-Patent-Appl-SN-948502; US-Patent-Class-73-746) Avail: US Patent and Trademark Office

An integral pressure sensor for a pressurized vessel, including a housing, a core element, a seal, and a spring, is presented. This combination is installed on the interior of the pressurized vessel. The core element is a magnetic element or a steel ball which moves in the housing under the effect of the vessel pressure and the chamber or housing pressure. The spring and seal, in concert with the core element, function to trap a specified volume of the pressurized medium in the chamber when the vessel is initially pressurized. When the pressurized vessel leaks, the trapped pressure within the chamber exceeds the vessel pressure thereby causing the core element to move. The position or presence of the core element is detected using a detecting device such as a Hall-effect device or another magnetic device. DTIC

N94-34719*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A MONOLITHIC SI BOLOMETER ARRAY FOR THE CALTECH SUBMILLIMETER OBSERVATORY
Ning Wang (California Inst. of Tech., Pasadena, CA.), T. R. Hunter (California Inst. of Tech., Pasadena, CA.), D. J. Benford (California Inst. of Tech., Pasadena, CA.), E. Serabyn (California Inst. of Tech., Pasadena, CA.), T. G. Phillips (California Inst. of Tech., Pasadena, CA.), and S. H. Moseley 1994 9 p Presented at the SPIE's 1994 Symposium on Astronomical Telescopes and Instrumentation for the 21st Century, Instrumentation in Astronomy, Kona, HI, 13-14 Mar. 1994 Submitted for publication
(NASA-TM-109402; NAS 1.15:109402) Avail: CASI HC A02/MF A01

We are developing a submillimeter continuum camera for the Caltech Submillimeter Observatory (CSO) located on Mauna Kea. The camera will employ a monolithic Si bolometer array which was developed by Moseley et al. at the NASA Goddard Space Flight Center (GSFC). The camera will be cooled to a temperature of about 300 mK in a He-3 cryostat, and will operate primarily at wavelengths of 350 and 450 micrometers. We plan to use a bolometer array with 1x24 directly illuminated pixels, each pixel of dimension 1x2 sq mm, which is about half of the F/4 beam size at these wavelengths. Each pixel is 10 to 12 micrometers thick and is supported only by four thin Si legs formed by wet chemical etch. The pixels are doped n-type by phosphorus implantation, compensated by boron implantation. Signals from the bolometer pixels are first amplified by cryogenically cooled FET's. The signals are further amplified by room-temperature amplifiers and then separately digitized by 16 bit A/D converters with differential inputs. The outputs of the A/D converters are fed into a digital signal processing board via fiber-optic cables. The electronics and data acquisition system were designed by the Goddard group. We will report the status of this effort. Author (revised)

N94-35078* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DUAL ACTIVE SURFACE, MINIATURE, PLUG-TYPE HEAT FLUX GAUGE Patent
Curt H. Liebert, inventor (to NASA) and John Koch, Jr., inventor (to NASA) 24 May 1994 8 p Filed 16 Apr. 1993 Supersedes N94-15928 (32 - 3, p 1033)
(NASA-Case-LEW-15643-1; US-Patent-5,314,247; US-Patent-Appl-SN-047120; US-Patent-Class-374-29; US-Patent-Class-374-166; Int-Patent-Class-G01K-17/00) Avail: US Patent and Trademark Office

A plug-type heat flux gauge can simultaneously measure heat flux on two opposite surfaces of thick or very thin convection or impingement cooled metal walls. The gauge is capable of continuously measuring transient and steady heat flux under transient and steady state gauge temperature operating conditions. The length of the gauge extends through the entire thickness of the material. A nonlinear temperature gradient through the gauge can be measured by attaching three to five thermocouples along the length of the gauge.
Official Gazette of the U.S. Patent and Trademark Office

N94-35114* National Aeronautics and Space Administration. Pasadena Office, CA.
CORRECTION-FREE PYROMETRY IN RADIANT WALL FURNACES Patent
Andrew S. W. Thomas, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.) 31 May 1994 12 p Filed 30 Mar. 1993 Supersedes N93-28322 (31 - 10, p 3046)
(NASA-Case-NPO-18655-1-CU; US-Patent-5,316,385; US-Patent-Appl-SN-044449; US-Patent-Class-374-130; US-Patent-Class-374-121; US-Patent-Class-250-340; US-Patent-Class-250-338.1; US-Patent-Class-356-43; Int-Patent-Class-G01J-5/08) Avail: US Patent and Trademark Office

A specular, spherical, or near-spherical target is located within a furnace having inner walls and a viewing window. A pyrometer located outside the furnace 'views' the target through pyrometer optics and the window, and it is positioned so that its detector sees only the image of the viewing

window on the target. Since this image is free of any image of the furnace walls, it is free from wall radiance, and correction-free target radiance is obtained. The pyrometer location is determined through a nonparaxial optical analysis employing differential optical ray tracing methods to derive a series of exact relations for the image location.
Official Gazette of the U.S. Patent and Trademark Office

N94-35224*# NYMA, Inc., Brook Park, OH.
DATA REDUCTION PROCEDURES FOR LASER VELOCIMETER MEASUREMENTS IN TURBOMACHINERY ROTORS Final Report
Jan Lepicovsky Jul. 1994 11 p Presented at the 7th International Symposium on Applications of Laser Techniques to Fluid Mechanics, Lisbon, Portugal, 11-14 Jul. 1994; sponsored by ADIST, CML, CTAMFUTL, Direccao Geral de Turismo, European Research Office, United States Army, Navy a
(Contract NAS3-27186; RTOP 505-62-20)
(NASA-CR-195343; E-8920; NAS 1.26:195343) Avail: CASI HC A03/MF A01

Blade-to-blade velocity distributions based on laser velocimeter data acquired in compressor or fan rotors are increasingly used as benchmark data for the verification and calibration of turbomachinery computational fluid dynamics (CFD) codes. Using laser Doppler velocimeter (LDV) data for this purpose, however, must be done cautiously. Aside from the still not fully resolved issue of the seed particle response in complex flowfields, there is an important inherent difference between CFD predictions and LDV blade-to-blade velocity distributions. CFD codes calculate velocity fields for an idealized rotor passage. LDV data, on the other hand, stem from the actual geometry of all blade channels in a rotor. The geometry often varies from channel to channel as a result of manufacturing tolerances, assembly tolerances, and incurred operational damage or changes in the rotor individual blades. Author

N94-33795*# Minnesota Mining and Mfg. Co., Saint Paul, MN.
HIGH PERFORMANCE QUARTER-INCH CARTRIDGE TAPE SYSTEMS
Ted Schwarz *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 31-43 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

N94-34354# Nanjing Aeronautical Inst. (China).
THREE DIMENSIONAL ICs INTELLIGENT SENSORS
Hou-Shu Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 207-210 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34358# Nanjing Aeronautical Inst. (China).
THE MEASUREMENT OF THREE-DIMENSIONAL GEOMETRIC PARAMETER
Ming Li and De-Zong Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 227-231 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34360# Nanjing Aeronautical Inst. (China).
A METHOD AVAILABLE FOR PROCESSING THE SIGNAL OF THERMOCOUPLES BY COMPUTER
Wen-Qing Han *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 237-240 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34361# Nanjing Aeronautical Inst. (China). Dept. of Measurements and Instrumentation Engineering.
A DISTRIBUTED OPTICAL FIBER STRAIN SENSOR FOR MONITORING STRUCTURAL DEFORMATIONS
Fei Luo and Zhi-He Wu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 241-243 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34365# Nanjing Aeronautical Inst. (China).
A NEW TYPE OF TEMPERATURE AND HUMIDITY DETECTION-CONTROL SYSTEM
Lian-Bo Jiao and Shu-Hui Lou *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 256-259 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

36 LASERS AND MASERS

Includes parametric amplifiers.
For related information see also *76 Solid-State Physics.*

N94-33405# Lawrence Livermore National Lab., CA.
PRECISION OPERATION OF THE NOVA LASER FOR FUSION EXPERIMENTS
J. A. Caird, R. B. Ehrlich, G. L. Hermes, O. L. Landen, C. W. Laumann, R. A. Lerche, J. L. Miller, J. E. Murray, N. D. Nielsen, and H. T. Powell Feb. 1994 4 p Presented at the 11th International Workshop on Laser Interaction and Related Plasma Phenomena, Montrey, CA, 25-29 Oct. 1993
(Contract W-7405-eng-48)
(DE94-007073; UCRL-JC-114966; CONF-931048-7) Avail: CASI HC A01/MF A01

A short communication concerning the precision operation of the Nova laser is presented. The Nova laser is used in fusion research. DOE

N94-33673 Texas Univ. at Dallas, Richardson, TX. Center for Quantum Electronics.
BASIC STUDY OF THE PUMPING OF A GAMMA RAY LASER Annual Report, 15 Mar. 1993 - 14 Mar. 1994
C. B. Collins 15 Apr. 1994 108 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-K-2005)
(AD-A278537; GRL/9401) Avail: CASI HC A06

The most productive approaches to the problem of the gamma-ray laser have focused upon upconversion techniques in which metastable nuclei are pumped with long wavelength radiation. At the nuclear level the storage of energy can approach tera-Joules (10(exp 12)J) per liter for thousands of years. However, any plan to use such a resource for a gamma-ray laser poses problems of a broad interdisciplinary nature requiring the fusion of concepts taken from relatively unrelated fields of physics. Our research group has described several means through which this energy might be coupled to radiation fields with cross sections for stimulated emission that could reach 1 x 10(exp -17)/sq cm. Such a stimulated release could lead to output powers as great as 3 X 10(exp 21) Watts/liter. Since 1978 we have pursued an approach for the upconversion of longer wavelength radiation incident upon isomeric nuclear populations that can avoid many of the difficulties encountered with traditional concepts of single-photon pumping. Experiments have confirmed the general theory and have indicated that a gamma-ray laser is feasible if the right combination of energy levels and branching ratios exists in some real material. DTIC

N94-33746# Williams Coll., Williamstown, MA.
COLLISION AND MOTIONAL AVERAGING EFFECTS IN CRYOGENIC ATOMIC HYDROGEN MASERS Final Technical Report, 1 Aug. 1991 - 31 Sep. 1993
Stuart B. Crampton and Donald R. McAllaster 30 Sep. 1993 11 p
(Grant AF-AFOSR-0312-91)
(AD-A278478; WMC-AFOSR-002; AFOSR-94-0194TR) Avail: CASI HC A03/MF A01

Substantial progress has been made toward optimizing the performance of the neon surface cryogenic hydrogen maser, preparatory to measuring the hyperfine induced frequency shifts (HIFS) in collisions between hydrogen atoms at low temperatures. Self-excited maser oscillation has been achieved at temperatures from 8.5 to 11.5 K. There is little surface relaxation at the higher temperatures. There is substantial collision broadening at the highest achievable atom densities, which is useful for spin exchange cavity tuning and which indicates the presence of measurable HIFS. We have also

made significant progress in understanding the Doppler effect in motional averaging systems such as the cryogenic maser. DTIC

N94-33860# Los Alamos National Lab., NM.
SINGLE-SHOT INTENSITY AND PHASE MEASUREMENTS OF DETUNING AND SATURATION EFFECTS IN AN ULTRASHORT XeCl AMPLIFIER
T. S. Clement, A. J. Taylor, R. Trebino, K. W. DeLong, and D. J. Kane 1994 5 p Presented at the 9th International Conference on Ultrafast Phenomena, Dana Point, CA, 1-5 May 1994
(Contract W-7405-eng-36)
(DE94-007535; LA-UR-94-485; CONF-940593-4) Avail: CASI HC A01/MF A01

The effects of detuning and saturation in XeCl amplifiers are studied using a single-shot self-diffraction frequency-resolved optical gating (FROG) device. DOE

N94-33905# Kentucky Univ., Lexington, KY. Dept. of Chemistry.
LASER SPECTROSCOPY AND DYNAMICS OF TRANSIENT SPECIES
D. J. Clouthier Feb. 1994 5 p
(Contract DE-FG05-86ER-13544)
(DE94-009318; DOE/ER-13544/T6) Avail: CASI HC A01/MF A01

Work was done on sub-Doppler spectroscopy of thioformaldehyde, electronic spectrum of FS2 radical, FTIR spectra of the transient molecule formyl chloride (HCOCl and DCOCl), and high-resolution FTIR spectra of the nu(sub 9) (CH2 wag) and nu(sub 5) (CSO symm. stretch) bands of sulfine (H2CSO), a transient species formed in pyrolysis of dimethyl sulfoxide and oxidation of thioformaldehyde. DOE

N94-33967# Geltech, Inc., Alachua, FL.
SILICA FRESNEL LENS FOR LASER COMMUNICATIONS Final Technical Report, 1 Jul. - 31 Dec. 1993
Bing F. Zhu and Jean-Luc Nogues 15 Mar. 1994 31 p
(Contract F49620-93-C-0043)
(AD-A278329; AFOSR-94-0154TR) Avail: CASI HC A03/MF A01

This document presents the results of the study on the fabrication and characterization of pure silica Fresnel lenses by a replication process. To demonstrate the replication capability of diffractive or Fresnel optics, Fresnel lenses were prepared by a sol-gel molding technique. The optical quality and performance and dimensional characteristics of the lenses are reported. Optical and physical properties tested included glass homogeneity, UV/VIS/NIR transmission, light scattering and surface profilometry. Optical performance testing indicated that these glass Fresnel lenses are as good as their parent plastic Fresnel lenses. Success in this development is to open an avenue to many other applications where silica glass Fresnel lenses would be superior to plastics, both in optical quality and environmental stability. DTIC

N94-34066*# Johns Hopkins Univ., Baltimore, MD. Dept. of Electrical and Computer Engineering.
RECEIVER DESIGN, PERFORMANCE ANALYSIS, AND EVALUATION FOR SPACE-BORNE LASER ALTIMETERS AND SPACE-TO-SPACE LASER RANGING SYSTEMS Interim Progress Report, 15 Apr. - 15 Oct. 1993
Frederic M. Davidson and Xiaoli Sun Oct. 1993 27 p
(Grant NAG5-2232)
(NASA-CR-195847; NAS 1.26:195847) Avail: CASI HC A03/MF A01

This interim report consists of four separate reports from our research on the receivers of NASA's Gravity And Magnetic Experiment Satellite (GAMES). The first report is entitled 'Analysis of phase estimation bias of GAMES receiver due to Doppler shift.' The second report is 'Background radiation on GAMES fine ranging detector from the moon, the planets, and the stars.' The third report is 'Background radiation on GAMES receivers from the ocean sun glitter and the direct sun.' The fourth report is 'GAMES receiver performance versus background radiation power on the detectors.' Author (revised)

N94-34136*# Alabama Univ., Huntsville, AL. Center for Applied Optics.
LASER/LIDAR ANALYSIS AND TESTING Final Report, 13 May 1992 - 12 May 1993
Gary D. Spiers 23 Feb. 1994 70 p
(Contract NAS8-38609)
(NASA-CR-193954; NAS 1.26:193954) Avail: CASI HC A04/MF A01

Section 1 of this report details development of a model of the output pulse frequency spectrum of a pulsed transversely excited (TE) CO2 laser. In order to limit the computation time required, the model was designed around a generic laser pulse shape model. The use of such a procedure allows many possible laser configurations to be examined. The output pulse shape is combined with the calculated frequency chirp to produce the electric field of the output pulse which is then computationally mixed with a local oscillator field to produce the heterodyne beat signal that would fall on a detector. The power spectral density of this heterodyne signal is then calculated. Section 2 reports on a visit to the LAWS laser contractors to measure the performance of the laser breadboards. The intention was to acquire data using a digital oscilloscope so that it could be analyzed. Section 3 reports on a model developed to assess the power requirements of a 5J LAWS instrument on a Spot MKII platform in a polar orbit. The performance was assessed for three different latitude dependent sampling strategies. Derived from text

N94-34374 Brookhaven National Lab., Upton, NY.
10-GW CO2 LASER SYSTEM AT THE BROOKHAVEN ACCELERATOR TEST FACILITY
I. Pogorelsky, J. Fischer, and A. S. Fisher et al 1993 8 p Presented at the LASERS 1993: International Conference on Lasers and Applications, Lake Tahoe, NV, 6-10 Dec. 1993 Prepared in cooperation with STI Optronics, Bellevue, WA Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contracts DE-AC02-76CH-00016; DE-AC06-83ER-40128)
(DE94-009001; BNL-60088; CONF-931237-8) Avail: CASI HC A02

Design and performance of a high peak-power CO2 laser system to produce subnanosecond IR pulses for electron acceleration experiment are presented. We discuss theoretical aspects of the picosecond laser pulse propagation in a molecular amplifier and a design approach towards compact Terawatt CO2 laser systems. DOE

37 MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N94-33366 Colorado Univ., Boulder, CO.
DECENTRALIZED CONTROL OF FLEXIBLE, MULTIBODY SYSTEMS Ph.D. Thesis
Brian Thomas Reisenauer 1992 131 p
Avail: Univ. Microfilms Order No. DA9318127

The appearance of multibody flexible systems in robotics, telerobotics, and space application invites our study of a new method for closed-loop controller design. These systems differ substantially from standard rigid multibody structures. Active control in the presence of flexibility may induce system instability. Furthermore, multibody systems differ from flexible structures in that mode shapes and mode frequencies continually change as the orientation of one body about another varies. Our work brings together ideas from decentralized control and multibody dynamics to address this unique challenge. The composite system method applies decentralized control to interconnected systems and suggests analytic tools for assessing system stability. Multibody dynamics introduces the application of a moving reference frame to minimize the interconnection between gross body motion and elastic deformation. Together, the combination yields a decentralized design methodology. System modeling as well as control architecture benefit from substructure division and the application of a pseudo-rigid reference frame. Lyapunov based analysis presents proximate design goals, provides a template for redesign, and develops a sufficient condition for composite stability. Several examples help us further understand the control method. We concentrate on articulated structures as a primary type of multibody system and examine different models. A simplified rotational spring model enables a comprehensive study of the design method with analysis, as well as control performance. We see how analysis offers insight into the decentralized design and engenders a rather robust controller. A more complicated assumed mode model provides a further test-bed for design, while a finite element model outlines the application of the approach to much more complicated systems. Dissert. Abstr.

N94-33437 Ohio State Univ., Columbus. Dept. of Materials Science and Engineering.
CONTINUING RESEARCH ON FRICTION AND WEAR OF MATERIALS Final Technical Report, 1 Oct. 1992 - 14 Sep. 1993
D. A. Rigney 21 Mar. 1994 18 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-92-J-1608)
(AD-A277690) Avail: CASI HC A03

This project was designed to provide new information on the effects of ion implantation on surface (adhesion, chemical effects) and subsurface (deformation) effects during unlubricated sliding of metals. The base materials are copper and iron. Thus, in some samples there should be mainly structural changes caused by implantation (e.g. Fe into Fe, Cu into Cu), while in others there will be composition changes as well (e.g., Cu into Fe, Fe into Cu). Copper and iron were chosen because of the considerable amount of literature available for comparison of results from testing of these metals. DTIC

N94-33586* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE STIRLING ENGINE (Videotape)
1992 Videotape: 7 min. 25 sec. playing time, in color, with sound
(NASA-TM-109832; NONP-VT-94-12960) Avail: CASI VHS A01/BETA A22

This video describes the Stirling engine, an external combustion engine which creates heat energy to power the motor, and can use many types of fuel. It can be used for both stationary and propulsion purposes and has advantages of better fuel economy and cleaner exhaust than internal combustion engines. The engine is shown being road tested at Langley Air Force Base. CASI

N94-33609*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
IMPROVEMENTS IN SPIRAL-BEVEL GEARS TO REDUCE NOISE AND INCREASE STRENGTH
David G. Lewicki, Robert F. Handschuh, Zachary S. Henry, and Faydor L. Litvin May 1994 8 p Proposed for presentation at the 1994 International Gearing Conference, England, 7-9 Sep. 1994; sponsored by the University of Newcastle Upon Tyne
(DA Proj. 1L1-62211-A-47-A; RTOP 505-62-10)
(NASA-TM-106613; E-8896; NAS 1.15:106613; ARL-TR-459) Avail: CASI HC A02/MF A01

Advanced-design spiral-bevel gears were tested in an OH-58D helicopter transmission using the NASA 500 hp Helicopter Transmission Test Stand. Four different gear designs were tested. The four designs tested were the current design of the OH-58D transmission, a higher-strength design the same as the current but with an increased fillet radius to reduce gear tooth bending stress, and two versions of a lower-noise design the same as the high-strength but with modified tooth geometry to reduce transmission error and noise. Noise, vibration, and tooth strain tests were performed and significant gear stress and noise reductions were achieved. Author

N94-33694 General Electric Co., Erie, PA.
PROPERLY SYNCHRONIZED MEASUREMENTS OF DROPLET SIZES FOR HIGH-PRESSURE INTERMITTENT COAL-WATER SLURRY FUEL SPRAYS
K. D. Kihm (Texas A&M Univ., College Station.), D. P. Terracina (Texas A&M Univ., College Station.), S. E. Payne (Texas A&M Univ., College Station.), and J. A. Caton (Texas A&M Univ., College Station.) 1993 8 p Presented at the 1993 Joint Central States and Eastern Sections of the Combustion Institute, New Orleans, LA, 15-17 Mar. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC21-88MC-23174)
(DE94-008980; DOE/MC-23174/94/C0326; CONF-930392-4) Avail: CASI HC A02

Experiments were completed to study intermittent coal-water slurry (CWS) fuel sprays injected from an electronically-controlled accumulator injector system. A new synchronization technique was developed using the light extinction signal as a triggering source for the data taking initiation with a laser diffraction particle analyzing (LDPA) technique. This technique allowed measurement of Sauter mean diameters (SMD's) near the spray tip where the light extinction was low and the data were free from the multiscattering bias. Coal-water slurry fuel with 50% coal loading in mass containing 5 micron mass median diameter coal particulates was considered. A correlation of the SMD with the injection conditions was determined which show a satisfactory agreement with the measured SMD data. The spray SMD showed an increase with the distance of the axial measurement location and with the ambient gas density and showed a decrease with increasing injection pressure. DOE

N94-33757 Department of the Navy, Washington, DC.
ROTARY HYDRAULIC SERVO OR THROTTLE VALVE Patent
Mark E. Shiffler, inventor (to Navy) and Luke W. Loy, inventor (to Navy) 7 Sep. 1993 7 p Filed 30 Sep. 1992
(AD-D016134; US-Patent-5,242,150; US-Patent-Appl-SN-953389; US-Patent-Class-251-209) Avail: US Patent and Trademark Office

A rotary servo or throttle valve comprises a housing defining a chamber and a discharge port in fluid communication with the chamber, a rotary valve spool for delivering fluid into the chamber, and a system for delivering pressurized fluid passing from the outlet opening of the valve in the chamber to the discharge port in the housing in which non-cavitating technology can be readily incorporated. The outlet opening of the valve spool is a wedge shaped groove formed in its periphery, the groove having opposed, accurately diverging sidewalls. The diffusing system comprises an elongated member which may be rotated in the chamber to align a plurality of flow paths with the discharge port and the outlet opening. The elongated member and valve spool may be rotated independently in opposite directions to obtain faster flow rate changes. DTIC

N94-33776 Creare, Inc., Hanover, NH.
SUPERCONDUCTING MEISSNER EFFECT BEARINGS FOR CRYOGENIC TURBOMACHINES, PHASE 2 Final Report, 1 Nov. 1989 - 28 Feb. 1994
Javier A. Valenzuela and Jerry L. Martin Feb. 1994 30 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-90-C-0007)
(AD-A277865; Creare-TM-1650-Phase-2) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This is the final report of a Phase 2 SBIR project to develop Meissner effect bearings for miniature cryogenic turbomachines. The bearing system was designed for use in miniature cryogenic turboexpanders in reverse-Brayton-cycle cryocoolers. The cryocoolers are designed to cool sensors on satellites. Existing gas bearings for this application run in a relatively warm state. The heat loss from the bearings into the shaft and into the cold process gas imposes a penalty on the cycle efficiency. By using cold Meissner effect bearings, this heat loss could be minimized, and the input power per unit of cooling for these cryocoolers could be reduced. Two bearing concepts were explored in this project. The first used an all-magnetic passive radial suspension to position the shaft over a range of temperatures from room temperature to 77 K. This bearing concept was proven to be feasible, but impractical for the miniature high-speed turbine application since it lacked the required shaft positioning accuracy. A second bearing concept was then developed. In this concept, the Meissner effect bearings are combined with self-acting gas bearings. The Meissner effect bearing provides the additional stiffness and damping required to stabilize the shaft at low temperature, while the gas bearing provides the necessary accuracy to allow very small turbine tip clearances (5mm) and high speeds (greater than 500,000 rpm). DTIC

N94-33873# Japan Atomic Energy Research Inst., Tokyo (Japan).
WELDABILITY OF Ni-Cr-W SUPERALLOY MANUFACTURED ON INDUSTRIAL SCALE
Hirokazu Tsuji, Hajime Nakajima, Teiichiro Saito, and Tamao Takatsu Sep. 1993 50 p
(DE94-727593; JAERI-M-93-163) Avail: CASI HC A03/MF A01

Research and development have been carried out on the new Ni-Cr-W superalloy as a structural material for process heating high-temperature gas-cooled reactors with coolant outlet temperatures of around 1000 C, and the optimum chemical composition has already been proposed. With a view to putting the newly developed Ni-Cr-W superalloy to a practical use, the proposed alloy was manufactured on an industrial scale, i.e., two tons. As a part of evaluation tests of the industrial scale material, weldability was examined in two kinds of heat treatment conditions, i.e., solution

treatment and re-solution treatment conditions. The results of the present study can be summarized as follows: (1) Weldability of the solution treated material is fair, and no great trouble is expected in practical welding. (2) Weldability of the re-solution treated material is slightly inferior to that of the solution treated one, and the guide bend tests for the butt welded joint show unsatisfactory results. Judging from the fact that the alloy whose chemical composition was almost equivalent to that of the material in the present study showed unsatisfactory weldability in the previous study, the weldability of Ni-Cr-W superalloys is not so good. The results of this study suggest that it is important to clarify the acceptable conditions concerning the levels of minor alloying elements and the heat treatment for the alloys in order to make the weldability of the alloys stable and that there is much prospect of a success of securing the reliability of the structures with weldments applying the technique of minor alloying element adjustment and optimizing the heat treatment condition. Futur plans are that basic data on the weldability of Ni-Cr-W superalloys will be accumulated furthermore, and research and development will be carried out with a view to securing the reliability of the structures with weldments. DOE

N94-33902# Lehigh Univ., Bethlehem, PA. Energy Research Center.
ROBOTIC WELD OVERLAY COATINGS FOR EROSION CONTROL
B. F. Levin, J. N. DuPont, and A. R. Marder 20 Jan. 1994 9 p
(Contract DE-FG22-92PC-92542)
(DE94-009703; DOE/PC-92542/T5) Avail: CASI HC A02/MF A01

Research is being conducted to develop criteria for selecting weld overlay coatings for erosion mitigation in circulated fluidized beds. Twelve weld overlay alloys were deposited on 1018 steel substrates using plasma arc welding. Ten samples from each coating were prepared for erosion testing. All selected coatings were erosion tested at 400C and their erosion resistance and microstructure evaluated. Steady state erosion rates were similar for several weld overlay coatings (Ultimet, Inconel-625, Iron-Aluminide, 316L SS, and High Chromium Cast Iron) and were considerably lower than the remaining coating evaluated. These coatings had different base (Co, Fe, Ni-base). No correlations were found between room temperature microhardness of the weld overlay coatings and their erosion resistance at elevated temperature, although this criteria is often thought to be an indicator of erosion resistance. It was suggested that the coatings that showed similar erosion rates may have similar mechanical properties such as fracture strength, toughness and work hardening rates at this temperature. During the past quarter, Iron-Aluminide, Inconel-625, and 316L SS coatings were selected for more detailed investigations based upon the preliminary erosion test results. Microhardness tests were performed on eroded samples to determine the size of the work hardened zone and change in coatings hardness due to erosion. The work hardened zone was correlated with erosion resistance of the coatings. Additional Iron-Aluminide, Inconel-625, and 316L SS coatings were deposited on 1018 steel substrates. DOE

N94-33946 General Electric Co., Erie, PA.
COAL-WATER SLURRY SPRAY CHARACTERISTICS OF AN ELECTRONICALLY-CONTROLLED ACCUMULATOR FUEL INJECTION SYSTEM
J. A. Caton, S. E. Payne, D. P. Terracina, and K. D. Kihm 1993 8 p Presented at the 16th Annual Energy-Sources Technology Conference and Exhibition, Houston, TX, 25 Jan. - 4 Feb. 1993
(Contract DE-AC21-88MC-23174)
(DE94-008977; DOE/MC-23174/94/C0323; CONF-930124-5) Avail: CASI HC A02/MF A01

Experiments have been complete to characterize coal-water slurry sprays from a electronically-controlled accumulator fuel injection system of diesel engine. The sprays were injected into a pressurized chamber equipped with windows. High speed movies, fuel pressures and needle lifts were obtained as a function of time, orifice diameter, coal loading, gas density in the chamber, and accumulator fuel pressure. For the base conditions 50% (by mass) coal loading, 0.4 mm diameter nozzle hole, coal-water slurry pressure of 82 MPa (12,000 psi), and a chamber density of 25 kg/m(exp 3), the break-up time was 0.30 ms. An empirical correlation for both spray tip penetration and initial jet velocity was developed. For the conditions of this study, the spray tip penetration and initial jet velocity were 15% greater for coal-water slurry than for diesel fuel or water. Cone angles of the sprays were dependent on the operating conditions and fluid, as well as the time and locations of the measurement. The time-averaged cone angle for the base case conditions was 13.6 degrees. Results of this study and the correlation are specific to the tested coal-water slurry and are not general for other coal-water slurry fuels. DOE

N94-33954*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
COMPARISON OF TRANSMISSION ERROR PREDICTIONS WITH NOISE MEASUREMENTS FOR SEVERAL SPUR AND HELICAL GEARS
Donald R. Houser (Ohio State Univ., Columbus.), Fred B. Oswald, Mark J. Valco, Raymond J. Drago, and Joseph W. Lenski, Jr. Jun. 1994 12 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-29 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE
(DA Proj. 1L1-62211-A-47-A; RTOP 505-62-36)
(NASA-TM-106647; E-8954; NAS 1.15:106647; ARL-TR-493; AIAA Paper 94-3366) Avail: CASI HC A03/MF A01

Measured sound power data from eight different spur, single and double helical gear designs are compared with predictions of transmission error by the Load Distribution Program. The sound power data was taken from the recent Army-funded Advanced Rotorcraft Transmission project. Tests were conducted in the NASA gear noise rig. Results of both test data and transmission error predictions are made for each harmonic of mesh frequency at several operating conditions. In general, the transmission error predictions compare favorably with the measured noise levels. Author

N94-33960*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ENGINE SEAL TECHNOLOGY REQUIREMENTS TO MEET NASA'S ADVANCED SUBSONIC TECHNOLOGY PROGRAM GOALS
Bruce M. Steinetz and Robert C. Hendricks Jun. 1994 13 p Presented at the 30th Joint Propulsion Conference, Indianapolis, IN, 27-29 Jun. 1994; sponsored by AIAA, ASME, SAE, and ASEE
(RTOP 505-630-5B)
(NASA-TM-106582; E-8842; NAS 1.15:106582; AIAA Paper 94-2698)
Avail: CASI HC A03/MF A01

Cycle studies have shown the benefits of increasing engine pressure ratios and cycle temperatures to decrease engine weight and improve performance of commercial turbine engines. NASA is working with industry to define technology requirements of advanced engines and engine technology to meet the goals of NASA's Advanced Subsonic Technology Initiative. As engine operating conditions become more severe and customers demand lower operating costs, NASA and engine manufacturers are investigating methods of improving engine efficiency and reducing operating costs. A number of new technologies are being examined that will allow next generation engines to operate at higher pressures and temperatures. Improving seal performance - reducing leakage and increasing service life while operating under more demanding conditions - will play an important role in meeting overall program goals of reducing specific fuel consumption and ultimately reducing direct operating costs. This paper provides an overview of the Advanced Subsonic Technology program goals, discusses the motivation for advanced seal development, and highlights seal technology requirements to meet future engine performance goals. Author

N94-33972*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
INFLUENCE OF GEAR DESIGN PARAMETERS ON GEARBOX RADIATED NOISE
Fred B. Oswald, Dennis P. Townsend, Mark J. Valco, Robert H. Spencer, Raymond J. Drago, and Joseph W. Lenski, Jr. Mar. 1994 8 p Proposed for presentation at the 1994 International Gearing Conference, Newcastle Upon Tyne, England, 7-9 Sep. 1994; sponsored by the United Kingdom National Gear Metrology Lab., Univ. of Newcastle Upon Tyne
(DA Proj. 1L1-62211-A-47; RTOP 505-62-36)
(NASA-TM-106511; E-8622; NAS 1.15:106511; ARL-TR-381) Avail: CASI HC A02/MF A01

Spur and helical gears were tested in the NASA gear-noise rig to compare the noise produced by different gear designs. Sound power measurements were performed under controlled conditions for a matrix of operating conditions. Sound power was computed from near-field acoustic intensity scans taken just above the top surface of the gearbox. Test gears included four spur and five helical gear designs. The gears were designed to be as nearly identical as possible except for deliberate

differences in tooth geometry and contact ratio. Test results are presented as a function of the gear design and operating conditions in the form of sound power charts and as narrow-band spectra. Author

N94-33981# General Electric Co., Erie, PA.
COAL-WATER SLURRY SPRAYS FROM AN ELECTRONICALLY CONTROLLED ACCUMULATOR FUEL INJECTION SYSTEM: BREAK-UP DISTANCES AND TIMES
J. A. Caton (Texas A&M Univ., College Station.), S. E. Payne (Texas A&M Univ., College Station.), D. P. Terracina (Texas A&M Univ., College Station.), and K. D. Kihm (Texas A&M Univ., College Station.) 1993 7 p Presented at the 1993 Joint Central States and Eastern Sections of the Combustion Institute, New Orleans, LA, 15-17 Mar. 1993
(Contract DE-AC21-88MC-23174)
(DE94-008979; DOE/MC-23174/94/C0325; CONF-930392-3) Avail: CASI HC A02/MF A01

Experiments have been completed to characterize coal-water slurry sprays from an electronically-controlled accumulator fuel injection system of a diesel engine. The sprays were injected into a pressurized chamber equipped with windows. High speed movies, fuel pressures, and needle lifts were obtained as a function of time, orifice diameter, coal loading, gas density in the chamber, and accumulator fuel pressure. For the base conditions (50% by mass coal loading, 0.4 mm diameter nozzle hole, coal-water slurry pressure of 82 MPa (12,000 psi), and a chamber density of 25 kg/m(exp 3)), the break-up time was 0.30 ms. An empirical correlation for spray tip penetration, break-up time, and initial jet velocity was developed. For the conditions of this study, the spray tip penetration and initial jet velocity were 15% greater for coal-water slurry than for diesel fuel or water. Results of this study and the correlation are specific to the tested coal-water slurry and are not general for other coal-water slurry fuels. DOE

N94-34017# General Electric Co., Erie, PA.
SYNCHRONIZED DROPLET SIZE MEASUREMENTS FOR COAL-WATER-SLURRY (CWS) DIESEL SPRAYS OF AN ELECTRONICALLY-CONTROLLED FUEL INJECTION SYSTEM
K. D. Kihm (Texas A&M Univ., College Station.), D. P. Terracina (Texas A&M Univ., College Station.), S. E. Payne (Texas A&M Univ., College Station.), and J. A. Caton (Texas A&M Univ., College Station.) 1993 10 p Presented at the 16th Annual Energy-Sources Technology Conference and Exhibition, Houston, TX, 25 Jan. - 4 Feb. 1993
(Contract DE-AC21-88MC-23174)
(DE94-008978; DOE/MC-23174/94/C0324; CONF-930124-4) Avail: CASI HC A02/MF A01

Experiments were completed to study intermittent coal-water slurry (CWS) fuel sprays injected from an electronically-controlled accumulator injector system. A laser diffraction particle analyzing (LDPA) technique was used to measure the spray diameters (Sauter mean diameter, SMD) assuming the Rosin-Rammler two parameter model. In order to ensure an accurate synchronization of the measurement with the intermittent sprays, a new synchronization technique was developed using the light extinction signal as a triggering source for the data taking initiation. This technique allowed measurement of SMD's near the spray tip where the light extinction was low and the data were free from the multiscattering bias. Coal-water slurry fuel with 50% coal loading in mass containing 5 (mu)m mass median diameter coal particulates was considered. Injection pressures ranging from 28 to 110 MPa, two different nozzle orifice diameters, 0.2 ad 0.4 mm, and four axial measurement locations from 60 to 120 mm from the nozzle orifice were studied. Measurements were made for pressurized (2.0 MPa in gauge) and for ambient chamber conditions. The spray SMD showed an increase with the distance of the axial measurement location and with the ambient gas density, and showed a decrease with increasing injection pressure. A correlation of the Sauter mean diameter with the injection conditions was determined. The results were also compared with previous SMD correlations that were available only for diesel fuel sprays. DOE

N94-34117* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ROBOTICS DEMO PEER GROUP REVIEW (Videotape)
[1994] Videotape: 13 min. playing time, in color, with sound
(NASA-TM-109849; NONP-VT-94-13714) Avail: CASI VHS A01/BETA A22

This animated color video shows the Shuttle robot arm performing construction on the Spacelab. CASI

N94-34144 Swedish Inst. for Materials Testing, Boras (Sweden). Fysik och Eleknik.
VIBRATING HAND-HELD MACHINES: THE APPLICABILITY OF VIBRATION VALUES MEASURED IN LABORATORY [HANDHALLNA VIBRERANDE MASKINER: ANVAENDBARHETEN HOS LABORATORIEMAETTA VIBRATIONSVAERDEN]
J. Olofsson 1993 52 p In SWEDISH
(PB94-149127; SP-RAPP-1993:35) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report contains the results and conclusions made from measurements of hand-arm vibration on 17 different models of portable hand-held machines. Each model has been tested according to the appropriate International Standard or Draft International Standard. The results from these tests have been compared with results from field measurements made on one to five machines of the same model. The comparison indicates that the mean values of hand-arm vibration as results from field measurements are 0.6 - 1.7 times those of laboratory measurement on the same model. Measurements have been made on four different families of vibrating hand-held machines: vertical and angle grinders, oscillating grinders, chipping hammers, and rotary hammers. The conclusion is that declared values based on laboratory measurements can be used for estimating vibration in real work situations. This is valid especially for new machines. NTIS

N94-34148*# North Dakota Univ., Grand Forks, ND.
PREDICTION OF CONTACT PATH AND LOAD SHARING IN SPIRAL BEVEL GEARS Final Report
George D. Bibel, Karuna Tiku, and Ashok Kumar Apr. 1994 116 p
(Grant NAG3-1476; DA Proj. 1L1-62211-A-47-A; RTOP 505-62-36)
(NASA-CR-195305; E-8711; NAS 1.26:195305; ARL-CR-146) Avail: CASI HC A06/MF A02

A procedure is presented to perform a contact analysis of spiral bevel gears in order to predict the contact path and the load sharing as the gears roll through mesh. The approach utilizes recent advances in automated contact methods for nonlinear finite element analysis. A sector of the pinion and gear is modeled consisting of three pinion teeth and four gear teeth in mesh. Calculation of the contact force and stresses through the gear meshing cycle are demonstrated. Summary of the results are presented using three dimensional plots and tables. Issues relating to solution convergence and requirements for running large finite element analysis on a supercomputer are discussed. Author (revised)

N94-34150 Department of the Navy, Washington, DC.
TORQUE APPLICATION TECHNIQUE AND APPARATUS Patent
Raymond P. Pineault, inventor (to Navy) 2 Nov. 1993 5 p Filed 14 Dec. 1992
(AD-D016124; US-Patent-5,257,556; US-Patent-Appl-SN-997264; US-Patent-Class-81-124.2) Avail: US Patent and Trademark Office

A tool which produces a measured torque is coupled to a bolt head or nut, located in a relatively inaccessible area, by apparatus which includes a wrench member affixed to an adaptor. The wrench member is sized and shaped to engage the fastener to be operated upon and the adaptor has a tubular construction with a tool engaging socket at one end. The adaptor is provided with an elongated slot which accommodates any wires which may pass through the fastener. DTIC

N94-34176*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ROTORDYNAMIC INSTABILITY PROBLEMS IN HIGH-PERFORMANCE TURBOMACHINERY, 1993
Jan. 1994 417 p Workshop held in College Station, TX, 10-12 May 1993; sponsored by Texas A and M Univ.
(RTOP 584-03-11)
(NASA-CP-3239; E-8199; NAS 1.55:3239) Avail: CASI HC A18/MF A04

Numerical, theoretical, and experimental results and control methods for seals, bearings, and dampers with some attention given to variable thermospherical properties and turbulence measurements are reported along with field experiences. For individual titles, see N94-34177 through N94-34200.

N94-34177*# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENTAL INVESTIGATION OF TURBINE BLADE-TIP EXCITATION FORCES
Manuel Martinez-Sanchez, Belgacem Jaroux, Seung Jin Song, Soom-Yung Yoo, and Taras Palczynski *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 3-14 (For primary document see N94-34176 10-37)
(Contract NAS8-35018)
Avail: CASI HC A03/MF A04

Results of a program to investigate the magnitude and parametric variations of rotordynamic forces which arise in high power turbines due to blade-tip leakage effects are presented. Five different unshrouded turbine configurations and one configuration shrouded with a labyrinth seal were tested with static offsets of the turbine shaft. The forces along and perpendicular to the offset were measured directly with a rotating dynometer. Exploration of casing pressure and flow velocity distributions was used to investigate the force-generating mechanisms. For unshrouded turbines, the cross-forces originate mainly from the classical Alford mechanisms while the direct forces arise mainly from a slightly skewed pressure pattern. The Alford coefficient for cross-force was found to vary between 2.4 and 4.0, while the similar direct force coefficient varied from 1.5 to 3.5. The cross-forces are found to increase substantially when the gap is reduced from 3.0 to 1.9% of blade height, probably due to viscous blade-tip effects. The forces also increase when the hub gap between stator and rotor decreases. The force coefficient decreased with operating flow coefficient. In the case of the shrouded turbine, most of the forces arise from nonuniform seal pressures. This includes about 80% for the transverse forces. The rest appears to come from uneven work extraction. Their level is about 50% higher in the shrouded case. Author (revised)

N94-34178*# Osaka Univ., Toyonaka (Japan).
ACTIVE CONTROL OF VANELESS DIFFUSER ROTATING STALL
Yoshiki Yoshida, Yoshinobu Tsujimoto, Tomohiro Tateishi, and Hiromu Tsurusaki *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 15-27 Sponsored by Ministry of Education (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

Experiments were carried out to study the feasibility of active stabilization of vaneless diffuser rotating stalls. Pressure fluctuation at the diffuser inlet was monitored and used to control the rotating stall. AC control flow, which is produced by a load speaker, was introduced into the diffuser at the inlet. It is shown that the rotating stall can be suppressed when the phase of the control flow has a certain relation with the phase of the rotating stall. By considering the energy flux due to the AC control flow, it is shown that the rotating stall is suppressed when the control flow has the phase such that the energy is subtracted out from the diffuser flow. Discussions are made on the relations between the energy flux and the amplitude of the pressure fluctuation due to the rotating stalls.
Derived from text

N94-34179*# Kobe Univ. (Japan).
AN EXPERIMENTAL STUDY ON THE STATIC AND DYNAMIC CHARACTERISTICS OF PUMP ANNULAR SEALS WITH TWO PHASE FLOW
T. Iwatsubo and T. Nishino *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 49-64 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

A new test apparatus is reconstructed and is applied to investigate static and dynamic characteristics of annular seals leaked by two phase flow (gas and liquid) for turbopumps. The fluid forces acting on the seals are measured for various parameters such as void ratio, the preswirl velocity, the pressure difference between the inlet and outlet of the seal, the whirling amplitude, and the ratio of whirling speed to spinning speed of the rotor. Influence of these parameters on the static and dynamic characteristics is investigated from the experimental results. As a result, with regard to the two phase flow, as the void ratio increases, the flow induced force decreases. Another dynamic characteristic of two phase flow is as almost similar as that of the monophase flow. Author

N94-34180*# Korean Inst. of Science and Technology, Seoul (Republic of Korea).
TEST RESULTS FOR ROTORDYNAMIC COEFFICIENTS OF ANTI-SWIRL SELF-INJECTION SEALS
C. H. Kim and Y. B. Lee *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 65-73 (For primary document see N94-34176 10-37)
Avail: CASI HC A02/MF A04

Test results are presented for rotordynamic coefficients and leakage for three annular seals which use anti-swirl self-injection concept to yield significant improvement in whirl frequency ratios as compared to smooth and damper seals. A new anti-swirl self-inection mechanism is achieved by deliberately machining self-injection holes inside the seal stator mechanism which is used to achieve effective reduction of the tangential flow which is considered as a prime cause of rotor instability in high performance turbomachinery. Test results show that the self-injection mechanism significantly improves whirl frequency ratios; however, the leakage performance degrades due to the introduction of the self-injection mechanism. Through a series of the test program, an optimum anti-swirl self-injection seal which uses a labyrinth stator surface with anti-axial flow injections is selected to obtain a significant improvement in the whirl frequency ratio as compared to a damper seal, while showing moderate leakage performance. Best whirl frequency ratio is achieved by an anti-swirl self-injection seal of 12 holes anti-swirl and 6 degree anti-leakage injection with a labyrinth surface configuration. When compared to a damper seal, the optimum configuration outperforms the whirl frequency ratio by a factor of 2. Author (revised)

N94-34181*# Texas A&M Univ., College Station, TX.
ECCENTRICITY EFFECTS UPON THE FLOW FIELD INSIDE A WHIRLING ANNULAR SEAL
Gerald L. Morrison, Robert E. DeOtte, Jr., Purandar G. Das, and H. Davis Thames *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 101-112 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

The flow field inside a whirling annular seal operating at a Reynolds number of 24,000 and a Taylor number of 6600 has been measured using a 3-D laser Doppler anemometer system. Two eccentricity ratios were considered, 0.10 and 0.50. The seal has a diameter of 164 mm, is 37.3 mm long, and has a clearance of 1.27 mm. The rotor was mounted eccentrically on the shaft such that the whirl ratio is 1.0 and the rotor follows a circular orbit. The mean axial velocity is not uniform around the circumference of the seal; near the inlet a region characterized by high velocity of the seal. By the exit, another region of high axial velocity is not uniform around the circumference of the seal; near the inlet a region characterized by high velocity of the seal. By the exit, another region of high axial velocity has developed, this time on the suction side of the seal. The magnitude and azimuthal distance of the migration increased with increasing whirl amplitude (eccentricity). Throughout the seal length, the azimuthal mean velocity varied inversely with the mean axial velocity. Increasing the whirl amplitude did not increase the magnitude of the azimuthal velocity at the seal exit. Author (revised)

N94-34182*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
APPLICATION OF AN IMPROVED NELSON-NGUYEN ANALYSIS TO ECCENTRIC, ARBITRARY PROFILE LIQUID ANNULAR SEALS
Satyasrinivas Padavala (Texas A&M Univ., College Station.), Alan B. Palazzolo (Texas A&M Univ., College Station.), Pat Vallely, and Steve Ryan *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 113-135 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

An improved dynamic analysis for liquid annular seals with arbitrary profile based on a method, first proposed by Nelson and Nguyen, is presented. An improved first order solution that incorporates a continuous interpolation of perturbed quantities in the circumferential direction, is presented. The original method uses an approximation scheme for circumferential gradients, based on Fast Fourier Transforms (FFT). A simpler scheme based on cubic splines is found to be computationally more efficient with better convergence at higher eccentricities. A new approach of

computing dynamic coefficients based on external specified load is introduced. This improved analysis is extended to account for arbitrarily varying seal profile in both axial and circumferential directions. An example case of an elliptical seal with varying degrees of axial curvature is analyzed. A case study based on actual operating clearances of an interstage seal of the Space Shuttle Main Engine High Pressure Oxygen Turbopump is presented. Author (revised)

N94-34183*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

A 3D-CFD CODE FOR ACCURATE PREDICTION OF FLUID FLOWS AND FLUID FORCES IN SEALS

M. M. Athavale (Computational Fluid Dynamics Research Corp., Huntsville, AL.), A. J. Przekwas (Computational Fluid Dynamics Research Corp., Huntsville, AL.), and R. C. Hendricks *In its* Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 137-147 (For primary document see N94-34176 10-37)

(Contract NAS3-25644)

Avail: CASI HC A03/MF A04

Current and future turbomachinery requires advanced seal configurations to control leakage, inhibit mixing of incompatible fluids and to control the rotodynamic response. In recognition of a deficiency in the existing predictive methodology for seals, a seven year effort was established in 1990 by NASA's Office of Aeronautics Exploration and Technology, under the Earth-to-Orbit Propulsion program, to develop validated Computational Fluid Dynamics (CFD) concepts, codes and analyses for seals. The effort will provide NASA and the U.S. Aerospace Industry with advanced CFD scientific codes and industrial codes for analyzing and designing turbomachinery seals. An advanced 3D CFD cylindrical seal code has been developed, incorporating state-of-the-art computational methodology for flow analysis in straight, tapered and stepped seals. Relevant computational features of the code include: stationary/rotating coordinates, cylindrical and general Body Fitted Coordinates (BFC) systems, high order differencing schemes, colocated variable arrangement, advanced turbulence models, incompressible/compressible flows, and moving grids. This paper presents the current status of code development, code demonstration for predicting rotordynamic coefficients, numerical parametric study of entrance loss coefficients for generic annular seals, and plans for code extensions to labyrinth, damping, and other seal configurations. Author

N94-34184*# Heriot-Watt Univ., Edinburgh (Scotland).

THE EFFECT OF INLET SWIRL ON THE DYNAMICS OF LONG ANNULAR SEALS IN CENTRIFUGAL PUMPS

M. Ismail, R. D. Brown, and D. France *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 149-165 (For primary document see N94-34176 10-37)

Avail: CASI HC A03/MF A04

This paper describes additional results from a continuing research program which aims to identify the dynamics of long annular seals in centrifugal pumps. A seal test rig designed at Heriot-Watt University and commissioned at Weir Pumps Research Laboratory in Alloa permits the identification of mass, stiffness, and damping coefficients using a least-squares technique based on the singular value decomposition method. The analysis is carried out in the time domain using a multi-fiequency forcing function. The experimental method relies on the forced excitation of a flexibly supported stator by two hydraulic shakers. Running through the stator embodying two symmetrical balance drum seals is a rigid rotor supported in rolling element bearings. The only physical connection between shaft and stator is the pair of annular gaps filled with pressurized water discharged axially. The experimental coefficients obtained from the tests are compared with theoretical values. Author

N94-34185*# Heriot-Watt Univ., Edinburgh (Scotland).

WHIRL MEASUREMENTS ON LEAKAGE FLOWS IN TURBOMACHINE MODELS **c34**

A. J. Addlesee, D. Altiparmak, and S. Pan *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 167-178 Sponsored in part by Weir Pumps Ltd. (For primary document see N94-34176 10-37)

Avail: CASI HC A03/MF A04

The beneficial effects claimed for whirl control devices demonstrate that the dynamic behavior of rotors is influenced by the fluid whirl in shaft and balance drum seals. The present paper reports results from two series of experiments, the first on the factors affecting the whirl at the seal inlet, and the second on the variation of whirl velocity along the seal. In both cases the LDA measurement technique required the clearance between the fixed and rotating parts of the models to be substantially greater than occurs in real machines, but the results are indicative nevertheless. Experimental and theoretical results are given for the radial distribution of whirl velocity in the gap between impeller shroud and pump casing. Results of tests with modified stator surfaces are also shown. This work leads naturally into the second series of experiments where some preliminary measurements of velocity distribution in the clearance between a fixed stator and a rotating shaft are reported for a range of inlet whirl conditions. Author

N94-34186*# Massachusetts Inst. of Tech., Cambridge.

ROTORDYNAMIC FORCES IN LABYRINTH SEALS: THEORY AND EXPERIMENT

Knox T. Millsaps and Manuel Martinez-Sanchez *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 179-207 (For primary document see N94-34176 10-37)

Avail: CASI HC A03/MF A04

A theoretical and experimental investigation of the aerodynamic forces generated by a single gland labyrinth seal executing a simultaneous spinning/whirling motion has been conducted. A lumped parameter model for a single gland seal with coupling to an upstream cavity with leakage is developed along with an appropriate solution technique. From this theory, it is shown that the presence of the upstream cavity can, in some cases, augment the cross-stiffness and direct damping by a factor of four. The parameters that govern the coupling are presented along with predictions on their influence. A simple uncoupled model is used to identify the mechanisms responsible for cross force generation. This reduced system is nondimensionalized and the physical significance of the reduced parameters is discussed. Closed form algebraic formulas are given for some simple limiting cases. It is also shown that the total cross-force predicted by the uncoupled model can be represented as the sum of an ideal component due to an inviscid flow with entry swirl and a viscous part due to the change in swirl created by friction inside the gland. The frequency dependent ideal part is solely responsible for the rotordynamic direct damping. The facility designed and built to measure these frequency dependent forces is described. Experimental data confirm the validity and usefulness of this ideal/viscous decomposition. A method for calculating the damping coefficients based on the force decomposition using only the static measurements is presented. Experimental results supporting the predicted cross force augmentation due to the effect of upstream coupling are presented. Author

N94-34187*# Technische Univ., Munich (Germany). Lehrstuhl Thermische Kraftanlagen.

CALCULATION AND MEASUREMENT OF THE INFLUENCE OF FLOW PARAMETERS ON ROTORDYNAMIC COEFFICIENTS IN LABYRINTH SEALS

K. Kwanka, W. Ortinger, and J. Steckel *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 209-218 (For primary document see N94-34176 10-37)

Avail: CASI HC A02/MF A04

First experimental investigations performed on a new test rig are presented. For a staggered labyrinth seal with fourteen cavities the stiffness coefficient and the leakage flow are measured. The experimental results are compared to calculated results which are obtained by a one-volume bulk-flow theory. A perturbation analysis is made for seven terms. It is found out that the friction factors have great impact on the dynamic coefficients. They are obtained by turbulent flow computation by a finite-volume model with the Reynolds equations used as basic equations. Author

N94-34188*# Kobe Univ. (Japan).

AN EXPERIMENTAL STUDY OF DYNAMIC CHARACTERISTICS OF LABYRINTH SEAL

Takuzo Iwatsubo, Koji Fukumoto, and Hideyuki Mochida *In* NASA. Lewis

Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 219-237 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

The fluid force due to labyrinth seal sometimes makes the turbomachineries unstable under higher rotating speed, higher pressure and higher power. Therefore, it is important to predict the magnitude and the direction of the fluid force and to evaluate the stability of the rotor system in design process. This paper shows the experimental results of the fluid force induced by a straight labyrinth seal and the rotordynamic coefficients calculated from the fluid force. Influences of the number of fins under the rotating speed, whirling speed, inlet pressure, and inlet tangential velocity are mainly investigated on a stability of the rotor system. The results show that increase of the number of fins makes the fluid force small and the rotor system stable, an increase of inlet pressure makes the fluid forces large and an increase of inlet tangential velocity makes the rotor system unstable. Author

N94-34189*# Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo (Japan).
OCCURRENCE OF SUB-SYNCHRONOUS VIBRATION IN A MULTISTAGE TURBINE PUMP AND ITS PREVENTION
Yanosuke Kanai and Shinobu Saito *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 241-248 (For primary document see N94-34176 10-37)
Avail: CASI HC A02/MF A04

It is because of the critical importance the prevention of vibration for high-load rotary machinery assumes in ensuring reliability of a plant as a whole that so many investigations and studies have been performed. A peculiar vibration encountered in a multistage turbine pump is presented and discussed. The pump was serving an active power plant in a part that was a veritable 'heart' of the entire plant, and the major vibration component was about 80 percent frequency of revolution. At first, the propagating stall was thought to be responsible, but the absence of higher harmonics made this presumption untenable. Or else, even though previous reports dealt with seemingly similar mechanical vibration troubles, they offer no clear diagnosis nor suggest simple remedial measures. It is for these reasons that the problem was investigated. Through fundamental tests and experiments, several insights into the nature of this anomalous vibration were gained, the fluid force that caused such a vibration was determined, and effective countermeasures were devised. Derived from text

N94-34190*# Weir Pumps Ltd., Glasgow (Scotland).
A REVIEW OF VIBRATION PROBLEMS IN POWER STATION BOILER FEED PUMPS
David France *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 249-276 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

Boiler feed pump reliability and availability is recognized as important to the overall efficiency of power generation. Vibration monitoring is often used as a part of planned maintenance. This paper reviews a number of different types of boiler feed pump vibration problems describing some methods of solution in the process. It is hoped that this review may assist both designers and users faced with similar problems. Author

N94-34191*# Bently Rotor Dynamics Research Corp., Minden, NV.
EXPERIMENTAL AND ANALYTICAL STUDY ON FLUID WHIRL AND FLUID WHIP MODES **c34**
Agnes Muszynska *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 277-291 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

Fluid whirl and fluid whip are rotor self-excited, lateral vibrations which occur due to rotor interactions with the surrounding fluid. There exist various modes of fluid whirl and fluid whip. These modes are close to rotor modes corresponding to free vibrations (based on the linear model). Small differences are due to nonlinearities in the system. This paper presents experimental and analytical results on the lowest modes of fluid whirls and fluid whip. Examples of rotors supported in fluid lubricated bearings show the variations of rotor deflection amplitudes and phases in the whirl and whip modes with changes of rotative speeds and/or changes in lumped mass locations along the shaft. Author

N94-34192*# Mechanical Technology, Inc., Latham, NY.
AN INVESTIGATION OF ANGULAR STIFFNESS AND DAMPING COEFFICIENTS OF AN AXIAL SPLINE COUPLING IN HIGH-SPEED ROTATING MACHINERY
C.-P. Roger Ku, James F. Walton, Jr., and Jorgen W. Lund *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 293-303 Sponsored by NASA. Marshall Space Flight Center (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

This paper provided an opportunity to quantify the angular stiffness and equivalent viscous damping coefficients of an axial spline coupling used in high-speed turbomachinery. A unique test methodology and data reduction procedures were developed. The bending moments and angular deflections transmitted across an axial spline coupling were measured while a nonrotating shaft was excited by an external shaker. A rotor dynamics computer program was used to simulate the test conditions and to correlate the angular stiffness and damping coefficients. In addition, sensitivity analyses were performed to show that the accuracy of the dynamic coefficients do not rely on the accuracy of the data reduction procedures. Author (revised)

N94-34193*# Northwestern Polytechnical Univ., Xian (China). Inst. of Vibration Engineering.
STABILITY AND STABILITY DEGREE OF A CRACKED FLEXIBLE ROTOR SUPPORTED ON JOURNAL BEARINGS
Guang Meng and Robert Gasch *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 305-323 Sponsored by Alexander von Humboldt Foundation and Huo Ying-Dong Youth Teachers Foundation (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

This paper investigates the stability and the stability degree of a flexible cracked rotor supported on different kinds of journal bearings. It is found that no matter what kind of bearings is used, the unstable zones caused by rotor crack locate always within the speed ratio (2/N) (1 - Delta K(sub xi)/4) is less than Omega is less than 2/N when gravity parameter W(sub R) is greater than 1.0, and locate always within the speed ratio (2 Omega(sub alpha)/N) (1 - Delta K(sub xi)/4) is less than Omega is less than 2 Omega(sub alpha)/N when W(sub R) is less than 0.1, where Delta K(sub xi) is the crack stiffness ratio, N = 1, 2, 3, 4, 5, ..., and Omega(sub alpha) = ((1 + 2 alpha)/2 alpha)(exp 1/2). When 0.1 is less than W(sub R) is less than 1.0, there is a region where no unstable zones caused by rotor crack exist. Outside the crack ridge zones, the rotor crack has almost no influence on system's stability and stability degree; while within the crack ridge zones, the stability and stability degree depend both on the crack and system's parameters. In some cases, the system may still be stable even when the crack is very large. For small gravity parameter (W(sub R) is less than 0.1), the mass ratio alpha has large influence on the position of unstable region, but its influence on the stability degree is small. The influence of fixed Sommerfeld number S(sub 0) on the crack stability degree is small although S(sub 0) has large influence on the stability degree of uncracked rotor. Author (revised)

N94-34194*# Mechanical Technology, Inc., Latham, NY.
AN EXPERIMENTAL AND THEORETICAL STUDY OF STRUCTURAL DAMPING IN COMPLIANT FOIL BEARINGS
C.-P. Roger Ku *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 327-337 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

This paper describes an experimental investigation into the dynamic characteristics of corrugated foil (bump foil) strips used in compliant surface foil bearings. This study provided and opportunity to quantify the structural damping of bump foil strips. The experimental data were compared to results obtained by a theoretical model developed earlier. The effects of bearing design parameters, such as static loads, dynamic displacement amplitudes, bump configurations, pivot locations, surface coatings, and

lubricant were also evaluated. An understanding of the dynamic characteristics of bump foil strips resulting from this work offers designers a means for enhancing the design of high-performance compliant foil bearings. Author (revised)

N94-34195*# New South Wales Univ., Kensington (Australia).
SQUEEZE FILM DAMPERS WITH OIL HOLE FEED
P. Y. P. Chen and E. J. Hahn *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 339-350 Sponsored by Australian Research Council (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

To improve the damping capability of squeeze film dampers, oil hole feed rather than circumferential groove feed is a practical proposition. However, circular orbit response can no longer be assumed, significantly complicating the design analysis. This paper details a feasible transient solution procedure for such dampers, with particular emphasis on the additional difficulties due to the introduction of oil holes. It is shown how a cosine power series solution may be utilized to evaluate the oil hole pressure contributions, enabling appropriate tabular data to be compiled. The solution procedure is shown to be applicable even in the presence of flow restrictors, albeit at the expense of introducing an iteration at each time step. Though not of primary interest, the procedure is also applicable to dynamically loaded journal bearings with oil hole feed.
Derived from text

N94-34196*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
HOTFIRE TESTING OF A SSME HPOTP WITH AN ANNULAR HYDROSTATIC BEARING
Steven A. Nolan (Rockwell International Corp., Canoga Park, CA.), Robert I. Hibbs (Rockwell International Corp., Canoga Park, CA.), and Gary G. Genge *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 351-371 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

A new fluid film bearing package has been tested in the Space Shuttle Main Engine (SSME) High Pressure Oxygen Turbopump (HPOTP). This fluid film element functions as both the pump end bearing and the preburner pump rear wear ring seal. Most importantly, it replaces a duplex ball bearing package which has been the primary life limiting component in the turbopump. The design and predicted performance of the turbopump are reviewed. Results are presented for measured pump and bearing performance during testing on the NASA Technology Test Bed (TTB) Engine located at MSFC. The most significant results were obtained from proximity probes located in the bearing bore which revealed large subsynchronous precession at ten percent of shaft speed during engine start which subsided prior to mainstage power levels and reappeared during engine shutdown at equivalent power levels below 65% of nominal. This phenomenon has been attributed to rotating stall in the diffuser. The proximity probes also revealed the location of the bearing in the bore for different operating speeds. Pump vibration characteristics were improved as compared to pumps tested with ball bearings. After seven starts and more than 700 seconds of testing, the pump showed no signs of performance degradation.
Author (revised)

N94-34197*# Bently Rotor Dynamics Research Corp., Minden, NV.
PARAMETER IDENTIFICATION OF A ROTOR SUPPORTED IN A PRESSURIZED BEARING LUBRICATED WITH WATER
John W. Grant, Agnes Muszynska, and Donald E. Bently *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 373-384 (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

A rig for testing an externally pressurized (hydrostatic), water-lubricated bearing was developed. Applying a nonsynchronous sweep frequency, rotating perturbation force with a constant amplitude as an input, rotor vibration response data was acquired in Bode and Dynamic Stiffness formats. Using this data, the parameters of the rotor/bearing system were identified. The rotor/bearing model was represented by the generalized (modal) parameters of the first lateral mode, with the rotational character of the fluid force taken into account. Author

N94-34198*# Texas A&M Univ., College Station, TX.
DYNAMIC FORCE RESPONSE OF SPHERICAL HYDROSTATIC JOURNAL BEARING FOR CRYOGENIC APPLICATIONS
Luis SanAndres *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 385-402 Sponsored by Rockwell International Corp. (For primary document see N94-34176 10-37)
Avail: CASI HC A03/MF A04

Hydrostatic Journal Bearings (HJB's) are reliable and resilient fluid film rotor support elements ideal to replace roller bearings in cryogenic turbomachinery. HJB' will be used for primary space-power applications due to their long lifetime, low friction and wear, large load capacity, large direct stiffness, and damping force coefficients. An analysis for the performance characteristics of turbulent flow, orifice compensated, spherical hydrostatic journal bearings (HJB's) is presented. Spherical bearings allow tolerance for shaft misalignment without force performance degradation and have also the ability to support axial loads. The spherical HJB combines these advantages to provide a bearing design which could be used efficiently on high performance turbomachinery. The motion of a barotropic liquid on the thin film bearing lands is described by bulk-flow mass and momentum equations. These equations are solved numerically using an efficient CFD method. Numerical predictions of load capacity and force coefficients for a 6 recess, spherical HJB in a LO2 environment are presented. Fluid film axial forces and force coefficients of a magnitude about 20% of the radial load capacity are predicted for the case analyzed. Fluid inertia effects, advective and centrifugal, are found to affect greatly the static and dynamic force performance of the bearing studied. Author

N94-34199*# Texas A&M Univ., College Station, TX.
A TEST APPARATUS AND FACILITY TO IDENTIFY THE ROTORDYNAMIC COEFFICIENTS OF HIGH-SPEED HYDROSTATIC BEARINGS
Dara Childs and Keith Hale *In* NASA. Lewis Research Center, Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 403-417 Sponsored by Rockwell International Corp. (For primary document see N94-34176 10-37)
(Grants NAGw-1194; NAGw-4449)
Avail: CASI HC A03/MF A04

A facility and apparatus are described which determine stiffness, damping, and added-mass rotordynamic coefficients plus steady-state operating characteristics of high speed hydrostatic journal bearings. The apparatus has a current top speed of 29,800 rpm with a bearing diameter of 7.62 cm (3 in.). Purified warm water, 55 C (130 F), is used as a test fluid to achieve elevated Reynolds numbers during operation. The test-fluid pump yields a bearing maximum inlet pressure of 6.9 Mpa (1000 psi). Static load on the bearing is independently controlled and measured. Orthogonally mounted external shakers are used to excite the test stator in the direction of, and perpendicular to, the static load. The apparatus can independently calculate all rotordynamic coefficients at a given operating condition.
Author (revised)

N94-34200*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A WAVED JOURNAL BEARING CONCEPT WITH IMPROVED STEADY-STATE AND DYNAMIC PERFORMANCE
Florin Dimofte *In its* Rotordynamic Instability Problems in High-Performance Turbomachinery, 1993 Jan. 1994 p 419-429 (For primary document see N94-34176 10-37)
(Grant NAG3-1370)
Avail: CASI HC A03/MF A04

Analysis of the waved journal bearing concept featuring a waved inner bearing diameter for use with a compressible lubricant (gas) is presented. A three wave, waved journal bearing geometry is used to show the geometry of this concept. The performance of generic waved bearings having either three, four, six, or eight waves is predicted for air lubricated bearings. Steady-state performance is discussed in terms of bearing load capacity, while the dynamic performance is discussed in terms of dynamic coefficients and fluid film stability. It was found that the bearing wave amplitude has an important influence on both steady-state and dynamic performance of the waved journal bearing. For a fixed eccentricity ratio, the bearing steady-state load capacity and direct dynamic stiffness coefficient increase as the wave amplitude increases. Also, the waved bearing becomes more

stable as the wave amplitude increases. In addition, increasing the number of waves reduces the waved bearing's sensitivity to the direction of the applied load relative to the wave. However, the range in which the bearing performance can be varied decreases as the number of waves increases. Therefore, both the number and the amplitude of the waves must be properly selected to optimize the waved bearing design for a specific application. It is concluded that the stiffness of an air bearing, due to the hydrodynamic effect, could be doubled and made to run stably by using a six or eight wave geometry with a wave amplitude approximately half of the bearing radial clearance. Author

N94-34963*# SECA, Inc., Huntsville, AL.
INDUCER ANALYSIS/PUMP MODEL DEVELOPMENT Final Report
Gary C. Cheng Mar. 1994 74 p
(Contract NAS8-38868)
(NASA-CR-196005; NAS 1.26:196005; SECA-FR-94-12) Avail: CASI HC A04/MF A01

Current design of high performance turbopumps for rocket engines requires effective and robust analytical tools to provide design information in a productive manner. The main goal of this study was to develop a robust and effective computational fluid dynamics (CFD) pump model for general turbopump design and analysis applications. A finite difference Navier-Stokes flow solver, FDNS, which includes an extended k-epsilon turbulence model and appropriate moving zonal interface boundary conditions, was developed to analyze turbulent flows in turbomachinery devices. In the present study, three key components of the turbopump, the inducer, impeller, and diffuser, were investigated by the proposed pump model, and the numerical results were benchmarked by the experimental data provided by Rocketdyne. For the numerical calculation of inducer flows with tip clearance, the turbulence model and grid spacing are very important. Meanwhile, the development of the cross-stream secondary flow, generated by curved blade passage and the flow through tip leakage, has a strong effect on the inducer flow. Hence, the prediction of the inducer performance critically depends on whether the numerical scheme of the pump model can simulate the secondary flow pattern accurately or not. The impeller and diffuser, however, are dominated by pressure-driven flows such that the effects of turbulence model and grid spacing (except near leading and trailing edges of blades) are less sensitive. The present CFD pump model has been proved to be an efficient and robust analytical tool for pump design due to its very compact numerical structure (requiring small memory), fast turnaround computing time, and versatility for different geometries. Author

N94-33664*# McDonnell-Douglas Aerospace, Huntington Beach, CA.
ON-ORBIT NDE: A NOVEL APPROACH TO TUBE WELD INSPECTION
Kerry Michaels and Greg Hughes *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 611-618 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33665*# Naval Postgraduate School, Monterey, CA. Dept. of Mechanical Engineering.
FORCE OVERRIDE RATE CONTROL FOR ROBOTIC MANIPULATORS
Morris Driels *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 619-627 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33666*# New Mexico Univ., Albuquerque, NM. Dept. of Computer Science.
GRAPHICAL PROGRAMMING: A SYSTEMS APPROACH FOR TELEROBOTIC SERVICING OF SPACE ASSETS
James T. Pinkerton, Michael J. McDonald, Robert D. Palmquist, and Richard Patten *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 629-640 See also N94-23201 (For primary document see N94-33612 10-99)
(Contract DE-AC04-76DP-00789)
Avail: CASI HC A03/MF A03

N94-33668*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE SCRAM TOOL-KIT
David Tamir (Rockwell International Corp., Cocoa Beach, FL.), Lee A. Flanigan (Rockwell International Corp., Huntsville, AL.), Jack L. Weeks (Rockwell International Corp., Huntsville, AL.), Thomas A. Siewert (National Inst. of Standards and Technology, Boulder, CO.), Andrew G. Kimbrough (Dimetrics, Inc., Davidson, NC.), and Sidney R. McClure *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 652-660 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34020*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
MICROROVER RESEARCH AT JPL Abstract Only
Brian Wilcox *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 1 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34021*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
DESIGN OF THE MESUR/PATHFINDER MICROROVER Abstract Only
Henry W. Stone *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 2 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34022*# Air Force Systems Command, Tyndall AFB, FL.
AIR FORCE CONSTRUCTION AUTOMATION/ROBOTICS Abstract Only
Al Nease and Christopher Dusseault *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 3 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34023*# Sandia National Labs., Albuquerque, NM. Advanced Vehicle Development Dept.
LUNAR EXPLORATION ROVER PROGRAM DEVELOPMENTS
P. R. Klarer *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 4-11 See also N94-23469 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34028*# Oak Ridge National Lab., TN.
DEVELOPMENT AND DEMONSTRATION OF A TELEROBOTIC EXCAVATION SYSTEM
Barry L. Burks, David H. Thompson, Stephen M. Killough, and Marion A. Dinkins *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 70-74 (For primary document see N94-34019 10-99)
(Contract DE-AC05-84OR-21400)
Avail: CASI HC A01/MF A04

N94-34029*# Pacific Northwest Lab., Richland, WA. Automation and Measurement Sciences Dept.
A TELEOPERATED SYSTEM FOR REMOTE SITE CHARACTERIZATION
Gerald A. Sandness, Bradley S. Richardson, and Jon Pence *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 75-84 (For primary document see N94-34019 10-99)
(Contracts DE-AC06-76RL-01830; DE-AC05-85OR-21400; W-7405-eng-48)
Avail: CASI HC A02/MF A04

N94-34030*# Sandia National Labs., Albuquerque, NM.
VEHICLE DEVELOPMENT OF LUNAR/MARS EXPLORATION Abstract Only
James W. Purvis *In* NASA. Johnson Space Center, The Seventh Annual

Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 85 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34032*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DEXTEROUS END EFFECTOR FLIGHT DEMONSTRATION
Edward L. Carter (Lockheed Engineering and Sciences Co., Houston, TX.) and Leo G. Monford *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 95-102 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34033*# Oceaneering Space Systems, Webster, TX.
UNDERSEA APPLICATIONS OF DEXTEROUS ROBOTICS Abstract Only
Mark M. Gittleman *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 103-111 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34034*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ROBOTIC TECHNOLOGIES OF THE FLIGHT TELEROBOTIC SERVICER (FTS) INCLUDING FAULT TOLERANCE
John T. Chladek and William M. Craver *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 112-120 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34036*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
HARDWARE INTERFACE FOR ISOLATION OF VIBRATIONS IN FLEXIBLE MANIPULATORS: DEVELOPMENT AND APPLICATIONS
Davoud Manouchehri (Rockwell International Corp., Downey, CA.), Thomas Lindsay (Rockwell International Corp., Downey, CA.), and David Ghosh *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 130-136 (For primary document see N94-34019 10-99)
(Contract NAS1-19243)
Avail: CASI HC A02/MF A04

N94-34039*# Fairchild Space Co., Germantown, MD.
THE SERVICING AID TOOL: A TELEOPERATED ROBOTICS SYSTEM FOR SPACE APPLICATIONS
Keith W. Dorman, John L. Pullen, William O. Keksz, Paul H. Eismann, Keith A. Kowalski, and James P. Karlen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 144-155 (For primary document see N94-34019 10-99)
Avail: CASI HC A03/MF A04

N94-34040*# Tooele Army Depot, UT.
ROBOTIC VEHICLE MOBILITY AND TASK PERFORMANCE: A FLEXIBLE CONTROL MODALITY FOR MANNED SYSTEMS Abstract only
Frederick Eldredge *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 156 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34335# Kitakyushu Coll. of Technology (Japan).
BILATERAL CONTROL TO COORDINATE OPERATORS WITH SUPPORTING SYSTEMS BY FORCE SENSED GRIPS
Mitsuru Soeda, Tadayoshi Furuya, and Tadashi Yamashita *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 117-121 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34338# Hankuk Aviation Univ., Kyunggido (Republic of Korea). Dept. of Mechanical Engineering and Design.
ADAPTIVE AUTOMATIC BALANCING OF MAGNETIC BEARING SYSTEMS
Jong-Sun Kim *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 131-135 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34341# Southeast Univ., Nanjing (China). Dept. of Instrument Science and Engineering.
A TEST SYSTEM OF POSE REPEATABILITY PRECISION OF MULTI-PATH ROBOT
Wei-Gong Zhang and Yu-Jian Zhai *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 146-149 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34344# Harbin Inst. of Tech. (China).
APPLICATION OF PROGRAMMABLE LOGIC CONTROLLER TO PUMP REGULATION SYSTEM FOR SUPPLYING WATER
Dao-Yi Ye, Yong-Bin Yang, and Zong-Qi Lu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 160-163 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34359# Yantai Univ. (China).
MEASUREMENTS OF THE SIS: MAGNETS AND SIS CONTROL SYSTEM
You-Lun Qin *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 232-236 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34366# Nanjing Aeronautical Inst. (China). Dept. of Mechanical Engineering.
COMPUTER IMAGE ANALYSIS OF WEAR DEBRIS WITH ITS APPLICATIONS TO MACHINE WEAR DIAGNOSIS
Hong-Fu Zuo, Jing-Lan Zhan, Bao-Chen Li, and Gui-Chun Tao *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 260-264 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34466# Sussex Univ., Brighton (England). Thermo-Fluid Mechanics Research Centre.
AN AIR BEARING SYSTEM FOR SMALL HIGH SPEED GAS TURBINES
A. B. Turner, S. J. Davies, and Y. L. Nimir *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 8 p Sponsored by Rolls-Royce Ltd. and Aisin Seiki Co. Ltd. (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N94-33688# Sandia National Labs., Albuquerque, NM.
NDE ACTIVITIES AND TECHNOLOGY TRANSFER AT SANDIA NATIONAL LABORATORIES
W. W. Shurtleff 1993 6 p Presented at the 1991 ASME Topical Conference, San Antonio, TX, 19-24 Apr. 1994
(Contract DE-AC04-94AL-85000)
(DE94-007294; SAND-93-2249C; CONF-9404120-1) Avail: CASI HC A02/MF A01

The NDE, Photometrics, and Optical Data Reduction Department at Sandia National Laboratories in New Mexico provides nondestructive evaluation (NDE) support for all phases of research and development at Sandia. Present facilities and personnel provide radiography, acoustic monitoring, ultrasonic scanning, computed tomography, shearography/ESPI, infrared imaging, high speed and ultra-high speed photometrics, and image processing. Although the department includes photometrics and optical data reduction as well as NDE, I will refer to the NDE department from now on for simplicity. The NDE department has worked on technology transfer to organizations inside and outside the weapons complex. This work has been performed in all the Sandia business sectors: defense programs, energy and environment, and work for others. The technology transfer has been in the form of testing for product improvement such as validation of aircraft inspection equipment, consultation such as detecting lathe bearing slip for a major machine tool manufacturer, and products such as an acoustic sand detector for the oil and gas industry. DOE

N94-33721* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
[ACTIVITIES OF THE NASA CENTERS] (Videotape)
Nov. 1989 Videotape: 15 min. playing time, in color, with sound (NASA-TM-109836; NONP-VT-94-12964) Avail: CASI VHS A01/BETA A22

This video highlights the NASA centers and their activities. Additionally, the commitment of the NASA centers to quality assurance is presented. CASI

N94-33626*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
APPLICATION OF STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY ANALYSIS PROCEDURES IN ORBITER PROCESSING ACTIVITIES AT THE KENNEDY SPACE CENTER
Robert R. Safford (University of Central Florida, Orlando.), Andrew E. Jackson (University of Central Florida, Orlando.), William W. Swart (University of Central Florida, Orlando.), and Timothy S. Barth *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 427-431 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-34334# Air Force Missile Coll., Xian (China).
AN INTELLIGENT ON-LINE FAILURE-DIAGNOSIS CARD WITH EXTENSIVE USAGE
Jiz-Hang Liu, Xiao-Qin Xia, and Wen-Hui Lu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 115-116 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34351# Chongqing Univ. (China). Inst. of Mechanical Engineering.
SOLID STATE ACOUSTICS INFORMATION TIME REGION SEPARATING METHODS FOR GEAR DIAGNOSIS OF FAILURES
Cheng-Bo Yu, De-Pei Liang, and Cheng Yang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 193-197 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N94-33370 Illinois Univ., Urbana-Champaign, IL.
THE DYNAMIC FLEXIBILITY METHOD IN STRUCTURAL DYNAMICS: APPLICATION TO NONUNIFORM BEAMS AND PLATES AND TO CAVITY-BACKED PLATES Ph.D. Thesis
Jinkyo Lee 1993 145 p
Avail: Univ. Microfilms Order No. DA9329094

Efficient and accurate analytical or semi-analytical solutions have been developed for the dynamics of one and two dimensional linear structures employing elemental dynamic flexibility formulation. This dissertation is divided into three parts. In the first, the elemental flexibility formulation is developed for Euler-Bernoulli beams having discontinuous section properties, which can be viewed as the synthesis of uniform beams, and the exactness of the solution is established. In the second, the elemental flexibility formulation is extended to thin rectangular plates having Levy boundary conditions, and conditions under which the exact solution can be achieved are presented. In the third, the structural-acoustic problem of Helmholtz fluid enclosed by a partially flexible cavity is posed and solved. Here, a concise analytical representation of the structural dynamics is used in conjunction with a boundary element approach for the fluid medium to give an efficient and accurate semi-analytical solution. All three sections are organized along similar lines. Following an introduction and review of the pertinent literature, the governing equations are derived and solved, a series of example problems is presented, the results from the examples are compared with similar results from the literature, and efficacy of the method when compared with other methods is discussed. This is followed by a general conclusions section and a series of appendices. Dissert. Abstr.

N94-33418 Georgia Inst. of Tech., Atlanta, GA.
NEAR TIP STRESS AND STRAIN FIELDS FOR SHORT ELASTIC CRACKS Ph.D. Thesis
Andy H. Soediono 1993 112 p
Avail: Univ. Microfilms Order No. DA9318581

Recent experimental studies in fracture have concluded an apparent anomalous behavior of short cracks regarding their growth characteristics. In order to investigate the reasons for this unexpected behavior, the present research focuses on identifying the crack length circumstances under which the requirements for a single parameter (K(sub I) or delta K(sub I) if cyclic loading is considered) characterization are violated. Furthermore, an additional quantity, the T stress, as introduced by Rice, is calculated for several crack lengths and two configurations, the center cracked (CC) and the single edge cracked (SEC) specimens. It is postulated that this additional quantity is needed for a complete description of the stress and strain field around a short crack; therefore crack growth prediction theories for short cracks should be based on a two-parameter characterization by K and T or B. In order to further verify the validity of this postulate, the influence of the third term of the Williams series on the stress and strain field around the crack tip and in particular on the B parameter is examined. Using the finite element method with linearly elastic material and isoparametric elements and axial (mode I) loading, T is calculated as a function of crack length, and the variation of the near tip stresses is compared with the expected ones from K-singularity. Further studies are performed regarding the crack tip plastic zone configuration. The results show that the plastic zone size is mostly underestimated from the K-singularity for short cracks. More importantly, a sizable plastic strip develops behind the crack tip in the short cracks. Crack size limitations for single-parameter characterization are suggested based on a suggested criterion that the stress at a specific distance ahead of the crack should be within 10 percent of the K field. It is clearly shown that it is not proper to postulate the crack size limits for 'short crack' behavior as a normalized ratio with the specimen width, a/w; it should instead be stated as an absolute, or normalized with the typical grain size, quantity. Finally, implications regarding the prediction of cyclic (fatigue) growth of short cracks are discussed. Dissert. Abstr.

N94-33541 Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
AN INVESTIGATION OF SIMULATED ANNEALING APPLIED TO STRUCTURAL OPTIMIZATION PROBLEMS M.S. Thesis
Richard C. McEachin Mar. 1994 111 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (AD-A278461; AFIT/GST/ENS/94M-08) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This thesis investigates the feasibility of using Simulated Annealing (SA) in structural optimization problems. The investigation involves solving

benchmark structural optimization problems with an SA algorithm, and comparing its solutions to those found by four other optimizers. Overall, the analysis shows that SA has limited applicability in structural optimization. Two primary factors were found to adversely impact the performance of the SA algorithm in these problems. These factors are high dimensionality, and high levels of constraint. The difficulty involved in solving these problems with a random search increases exponentially with the number of dimensions. The number, and non-linearity, of the constraints also have an appreciable effect on the success of the algorithm. A Measure of Complexity was created to quantify the combined effect of dimensionality and level of constraint. This measure can be used to predict the applicability of the SA algorithm in optimizing a given system of non-linear equations. DTIC

N94-33552 Defense Industrial Supply Center, Philadelphia, PA. Directorate of Engineering and Standardization.

SUSCEPTIBILITY OF GRADE 8 FASTENERS TO STRESS CORROSION CRACKING

Bohdan Hasiuk 8 Oct. 1993 33 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A277883) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A brief historical review of the development of plane strain, elastic, fracture mechanics is presented. Fracture toughness parameter, K(sub I c*), and stress corrosion cracking threshold level (parameter) K(sub I scc) are introduced and elaborated upon. The use of fracture mechanics - via the K(sub I scc) concept - to assess the resistance of low alloy steel to stress corrosion cracking in hostile environments is outlined and referenced. Based on the data presented in this report, it is concluded that zinc plated, low alloy steel fasteners below one inch in diameter, in the yield strength range of 130 to 160 ksi, are immune to stress corrosion cracking in sea water environment. DTIC

N94-33691# Oak Ridge National Lab., TN.

MAPPING OF RESIDUAL STRAINS OF A CERAMIC-TO-METAL JOINT USING X RAY DIFFRACTION

T. R. Watkins, X. L. Wang, S. Spooner, C. R. Hubbard, S. J. Vance, B. H. Rabin, and R. L. Williamson 1994 7 p Presented at the 4th International Conference on Residual Stress (ICRS-4), Baltimore, MD, Jun. 1994

(Contract DE-AC05-84OR-21400)

(DE94-007421; CONF-940692-2) Avail: CASI HC A02/MF A01

In this study, the residual strains in the iron layer of a zirconia-iron joint, brazed with a metal alloy, were measured with x ray diffraction as a function of distance from the joint. The residual strains were measured at various key locations indicated by a finite element model (FEM). The x ray residual strain mapping results were compared to neutron diffraction mapping results. These data were combined to provide a complete residual strain profile of these samples and were compared with results of FEM. DOE

N94-33704*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.

MECHANICAL AND THERMAL BUCKLING ANALYSIS OF RECTANGULAR SANDWICH PANELS UNDER DIFFERENT EDGE CONDITIONS

William L. Ko Washington Apr. 1994 67 p

(RTOP 532-09-01)

(NASA-TM-4584; H-1932; NAS 1.15:4584) Avail: CASI HC A04/MF A01

The combined load (mechanical or thermal load) buckling equations were established for orthotropic rectangular sandwich panels under four different edge conditions by using the Rayleigh-Ritz method of minimizing the total potential energy of a structural system. Two-dimensional buckling interaction curves and three-dimensional buckling interaction surfaces were constructed for high-temperature honeycomb-core sandwich panels supported under four different edge conditions. The interaction surfaces provide overall comparison of the panel buckling strengths and the domains of symmetrical and antisymmetrical buckling associated with the different edge conditions. In addition, thermal buckling curves of these sandwich panels are presented. The thermal buckling conditions for the cases with and without thermal moments were found to be identical for the small deformation theory. Author

N94-33951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROBABILISTIC ASSESSMENT OF UNCERTAIN ADAPTIVE HYBRID COMPOSITES

Michael C. Shiao (Sverdrup Technology, Inc., Brook Park, OH.), Surendra N. Singhal (Sverdrup Technology, Inc., Brook Park, OH.), and Christos C. Chamis Jun. 1994 17 p Presented at the Third International Conference on Adaptive Structures, San Diego, CA, 11-13 Nov. 1992

(Contract NAS3-25266; RTOP 510-02-12)

(NASA-TM-106515; E-8634; NAS 1.15:106515) Avail: CASI HC A03/MF A01

Adaptive composite structures using actuation materials, such as piezoelectric fibers, were assessed probabilistically utilizing intraply hybrid composite mechanics in conjunction with probabilistic composite structural analysis. Uncertainties associated with the actuation material as well as the uncertainties in the regular (traditional) composite material properties were quantified and considered in the assessment. Static and buckling analyses were performed for rectangular panels with various boundary conditions and different control arrangements. The probability density functions of the structural behavior, such as maximum displacement and critical buckling load, were computationally simulated. The results of the assessment indicate that improved design and reliability can be achieved with actuation material. Author

N94-33958*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

A FULLY ASSOCIATIVE, NON-LINEAR KINEMATIC, UNIFIED VISCOPLASTIC MODEL FOR TITANIUM BASED MATRICES

S. M. Arnold, A. F. Saleeb, and M. G. Castelli Jun. 1994 26 p Presented at the Symposium on Life Prediction Methodology for Titanium Matrix Composites, Hilton Head, SC, 22-24 Mar. 1994; sponsored by the American Society for Testing and Materials

(Contract NAS3-27186; NAG3-901; RTOP 763-22-2F)

(NASA-TM-106609; E-8890; NAS 1.15:106609) Avail: CASI HC A03/MF A01

Specific forms for both the Gibb's and complementary dissipation potentials are chosen such that a complete (i.e., fully associative) potential based multiaxial unified viscoplastic model is obtained. This model possesses one tensorial internal state variable that is associated with dislocation substructure, with an evolutionary law that has nonlinear kinematic hardening and both thermal and strain induced recovery mechanisms. A unique aspect of the present model is the inclusion of non-linear hardening through the use of a compliance operator, derived from the Gibb's potential, in the evolution law for the back stress. This non-linear tensorial operator is significant in that it allows both the flow and evolutionary laws to be fully associative (and therefore easily integrated) and greatly influences the multiaxial response under non-proportional loading paths. In addition to this nonlinear compliance operator, a new consistent, potential preserving, internal strain unloading criterion has been introduced to prevent abnormalities in the predicted stress-strain curves, which are present with nonlinear hardening formulations, during unloading and reversed loading of the external variables. Specification of an experimental program for the complete determination of the material functions and parameters for characterizing a metallic matrix, e.g., TIMETAL 21S, is given. The experiments utilized are tensile, creep, and step creep tests. Finally, a comparison of this model and a commonly used Bodner-Partom model is made on the basis of predictive accuracy and numerical efficiency. Author

N94-34075*# Alabama Univ., Tuscaloosa, AL. Dept. of Engineering Science and Mechanics.

USE OF PHOTOSTRESS TO ANALYZE BEHAVIOR OF AN AFT SKIRT TEST SPECIMEN Final Report

S. C. Gambrell, Jr. May 1994 73 p Original contains color illustrations

(Grant NAG8-293)

(NASA-CR-195850; NAS 1.26:195850; BER-607-97) Avail: CASI HC A04/MF A01; 18 functional color pages

Strains at twenty-one selected points in the critical lower weld region of a aft skirt of a solid rocket booster of the shuttle were measured using photoelastic coatings and stress separator gages. Data were taken at loads of 5, 14, 20, 28, 42, 56, and 70 percent of the design limit load. Results indicate that general yielding occurred in the weld metal and for a

short distance outside the fusion boundaries on either side of the weld metal. The fusion boundaries did not yield at the 70 percent load. Slight non-linearity in the load strain curves were observed at several points above the 20 percent load level. Maximum measured strains occurred at points in the forged metal of the holddown post along a line 0.50 inches from the centerline of the weld. Maximum shearing strains within the area covered by the photoelastic coating occurred at points approximately 0.33 inches to the right of the weld centerline near points 6 and 7 and lying along a yellow vertical line extending from just below point 6 to point 11. Photoelastic coatings were shown to be an excellent method to provide the whole field strain distribution in the region of the critical weld and to enhance the overall understanding of the behavior of the welded joint.
Author

N94-34236*# Lockheed Missiles and Space Co., Sunnyvale, CA.
CONCEPTUAL DESIGN AND ANALYSIS OF A DYNAMIC SCALE MODEL OF THE SPACE STATION FREEDOM
D. A. Davis, M. J. Gronet, M. K. Tan, and J. Thorne May 1994 147 p
(Contract NAS1-19241; RTOP 585-03-11-09)
(NASA-CR-4598; NAS 1.26:4598; LMSC/F440397) Avail: CASI HC A07/MF A02

This report documents the conceptual design study performed to evaluate design options for a subscale dynamic test model which could be used to investigate the expected on-orbit structural dynamic characteristics of the Space Station Freedom early build configurations. The baseline option was a 'near-replica' model of the SSF SC-7 pre-integrated truss configuration. The approach used to develop conceptual design options involved three sets of studies: evaluation of the full-scale design and analysis databases, conducting scale factor trade studies, and performing design sensitivity studies. The scale factor trade study was conducted to develop a fundamental understanding of the key scaling parameters that drive design, performance and cost of a SSF dynamic scale model. Four scale model options were estimated: 1/4, 1/5, 1/7, and 1/10 scale. Prototype hardware was fabricated to assess producibility issues. Based on the results of the study, a 1/4-scale size is recommended based on the increased model fidelity associated with a larger scale factor. A design sensitivity study was performed to identify critical hardware component properties that drive dynamic performance. A total of 118 component properties were identified which require high-fidelity replication. Lower fidelity dynamic similarity scaling can be used for non-critical components.
Author

N94-34262*# Virginia Polytechnic Inst. and State Univ., Blacksburg, VA.
INFLUENCE OF AN ASYMMETRIC RING ON THE MODELING OF AN ORTHOGONALLY STIFFENED CYLINDRICAL SHELL
Naveen Rastogi and Eric R. Johnson 1994 45 p
(Grant NAG1-537)
(NASA-CR-195953; NAS 1.26:195953) Avail: CASI HC A03/MF A01

Structural models are examined for the influence of a ring with an asymmetrical cross section on the linear elastic response of an orthogonally stiffened cylindrical shell subjected to internal pressure. The first structural model employs classical theory for the shell and stiffeners. The second model employs transverse shear deformation theories for the shell and stringer and classical theory for the ring. Closed-end pressure vessel effects are included. Interacting line load intensities are computed in the stiffener-to-skin joints for an example problem having the dimensions of the fuselage of a large transport aircraft. Classical structural theory is found to exaggerate the asymmetric response compared to the transverse shear deformation theory.
Author

N94-34286 Department of the Navy, Washington, DC.
METHOD AND MEANS FOR ISOLATING EQUIPMENT FROM SHOCK LOADS Patent Application
Allan Rydberg, inventor (to Navy) 29 Dec. 1993 11 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016161; US-Patent-Appl-SN-174926; Navy-Case-74760) Avail: CASI HC A03

The current invention is a method and apparatus for shock mounting an object in a container. A container is provided having side walls to accommodate movement of the object. The container is filled with a fluid having substantially the same density as the object to be shock mounted. The object is mounted in the container by a plurality of shock mounts. In accordance with the apparatus, a container is provided with an incompressible fluid therein. The object to be shock mounted is immersed in the fluid and suspended at an equilibrium position in the fluid filled container. The object can be a circuit board or some other similarly delicate device.
DTIC

N94-34299*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SMALL-CRACK EFFECTS IN HIGH-STRENGTH ALUMINUM ALLOYS
J. C. Newman, Jr., X. R. Wu, S. L. Venneri, and C. G. Li May 1994 116 p
(RTOP 505-63-50-04)
(NASA-RP-1309; L-17244; NAS 1.61:1309) Avail: CASI HC A06/MF A02

The National Aeronautics and Space Administration and the Chinese Aeronautical Establishment participated in a Fatigue and Fracture Mechanics Cooperative Program. The program objectives were to identify and characterize crack initiation and growth of small cracks (10 microns to 2 mm long) in commonly used US and PRC aluminum alloys, to improve fracture mechanics analyses of surface- and corner-crack configurations, and to develop improved life-prediction methods. Fatigue and small-crack tests were performed on single-edgenotch tension (SENT) specimens and large-crack tests were conducted on center-crack tension specimens for constant-amplitude (stress ratios of -1, 0, and 0.5) and Mini-TWIST spectrum loading. The plastic replica method was used to monitor the initiation and growth of small fatigue cracks at the semicircular notch. Crack growth results from each laboratory on 7075-T6 bare and LC9cs clad aluminum alloys agreed well and showed that fatigue life was mostly crack propagation from a material defect (inclusion particles or void) or from the cladding layer. Finite-element and weight-function methods were used to determine stress intensity factors for surface and corner cracks in the SENT specimens. Equations were then developed and used in a crack growth and crack-closure model to correlate small- and large-crack data and to make life predictions for various load histories. The cooperative program produced useful experimental data and efficient analysis methods for improving life predictions. The results should ultimately improve aircraft structural reliability and safety.
Author

N94-34304 Institute of Sound and Vibration Research, Southampton (England).
AN ANALYTICAL STUDY OF THE VIBRATION OF BEAMS FITTED WITH NEUTRALIZERS. PART 1: ASSESSMENT OF THE EFFECTS OF NEUTRALIZER DESIGN PARAMETERS
P. Clark and R. G. White Jan. 1993 53 p
(ISVR-TR-224-Pt-1) Copyright Avail: Issuing Activity

When attempting to control the vibration transmitted from machinery installations, perhaps with a view to reducing the unwanted radiation of noise at a point remote from the source, it is essential that all possible transmission paths are considered. With the majority of industrial machinery installations it is one-dimensional or beam-like structures - for example, pipework and other mechanical linkages - which form one of the main vibration paths which bypass isolator systems. It is of interest to consider the effects that the addition of certain discontinuities to this type of structure would have on the overall vibration transmission properties of the complete system. The discontinuity considered in detail in this report is the vibration neutralizer. By utilizing the concept of vibrational power transmission, the effects of varying design parameters on the performance of a neutralizer as a vibration attenuator are considered.
Author

N94-34307 Institute of Sound and Vibration Research, Southampton (England). Fluid Dynamics and Acoustics Group.
MEASUREMENTS OF CORRELATION COEFFICIENTS OF VIBRATION ON A CAR BODY SHELL
M. W. Bonilha and F. J. Fahy Aug. 1993 49 p
(ISVR-TR-220) Copyright Avail: Issuing Activity

Probabilistic approaches such as Statistical Energy Analysis (SEA) and deterministic approaches such as The Finite Element Method (FEM) are widely used in Automotive Engineering to predict sound pressure levels in the passenger compartment. Due to particular characteristics of each method neither is optimum when applied in mid-frequency ranges (around 100-300 Hz). The use of a hybrid model SEA/FEM is one solution to close the

gap between the two methods in this frequency range. The main assumption of such a hybrid model is that the car-body-shell structural wave field is diffuse. In the present work the diffuseness of a car body shell is assessed using correlation coefficients of acceleration measured on a fully trimmed car. Some evidence of diffuse wave field behavior in the 100-300 Hz frequency range is found on the roof vibrational field. However, in view of other results, it is not possible to regard the entire car body structural wave field as diffuse in this frequency range. Reasons for this deviation are given based upon number of excited modes, local perturbations and type of excitation used. Author

N94-34385*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

VARIATIONS OF A GLOBAL CONSTRAINT FACTOR IN CRACKED BODIES UNDER TENSION AND BENDING LOADS

J. C. Newman, Jr., J. H. Crews, Jr., C. A. Bigelow, and D. S. Dawicke May 1994 29 p

(RTOP 538-02-10-01)

(NASA-TM-109119; NAS 1.15:109119) Avail: CASI HC A03/MF A01

Elastic-plastic finite-element analyses were used to calculate stresses and displacements around a crack in finite-thickness plates for an elastic-perfectly plastic material. Middle- and edge-crack specimens were analyzed under tension and bending loads. Specimens were 1.25 to 20 mm thick with various widths and crack lengths. A global constraint factor alpha(sub g), an averaged normal-stress to flow-stress ratio over the plastic region, was defined to simulate three-dimensional (3D) effects in two-dimensional (2D) models. For crack lengths and uncracked ligament lengths greater than four times the thickness, the global constraint factor was found to be nearly a unique function of a normalized stress-intensity factor (related to plastic-zone size to thickness ratio) from small- to large-scale yielding conditions for various specimen types and thickness. For crack length-to-thickness ratios less than four, the global constraint factor was specimen type, crack length and thickness dependent. Using a 2D strip-yield model and the global constraint factors, plastic-zone sizes and crack-tip displacements agreed reasonably well with the 3D analyses. For a thin sheet aluminum alloy, the critical crack-tip-opening angle during stable tearing was found to be independent of specimen type and crack length for crack length-to-thickness ratios greater than 4. Author

N94-34581# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Structures and Materials Panel.

AN ASSESSMENT OF FATIGUE DAMAGE AND CRACK GROWTH PREDICTION TECHNIQUES [L'EVALUATION DE L'ENDOMMAGEMENT EN FATIGUE ET LES TECHNIQUES DE PREDICTION DE LA PROPAGATION DES FISSURES]

Mar. 1994 278 p 77th Meeting held in Bordeaux, France, 29-30 Sep. 1993

(AGARD-R-797; ISBN-92-835-0734-7) Copyright Avail: CASI HC A13/MF A03

Fatigue is an important consideration in structural design and monitoring of continued airworthiness of military aircraft. This Workshop titled 'An Assessment of Fatigue Damage and Crack Growth Prediction Techniques' provided a forum for an in-depth discussion of the correlation between in-service experience and results from analytical predictive models, specimen level tests, component tests, and full-scale tests. Additionally, it made possible an examination of the operating standards that different countries adopt with respect to various elements in the design process for assessment of fatigue damage. For individual titles, see N94-34582 through N94-34599.

N94-34582# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (Germany).

MINER'S RULE REVISITED

W. Schuetz and P. Heuler *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 10 p (For primary document see N94-34581 10-39)

Copyright Avail: CASI HC A02/MF A03

In the first sections, the requirements to be met by hypotheses for fatigue life prediction (including those for the crack initiation and crack propagation phases) are discussed in detail. These requirements are shown to be different for 'scientific' and for 'industrial' fatigue life prediction. Aspects with regard to an assessment of fatigue life prediction hypotheses are discussed. The last section presents the results of a large cooperative program between IABG and several automobile manufacturers, in which Miner's Rule in several versions was assessed against spectrum tests with five different actual automobile components: forged steel stub axle; forged steel stub axle, induction hardened; sheet steel welded rear axle (front wheel drive car); cast aluminum wheel; and welded sheet steel wheel. Since up to 80 components each were available, and two different, but typical, automotive stress-time histories were employed, the assessment was very thorough, avoiding many of the drawbacks of previous assessments. It is shown that damage sums to failure were usually far below 1.0; they also depended on the component in question, the aluminum wheel resulting in the lowest damage sums to failure; the damage sums to failure where always lower for a mild spectrum than for a severe one; and the influence of spectrum variation was predicted best - among the hypotheses tested - by use of a recent proposal of Zenner and Liu. Author (revised)

N94-34583*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

FATIGUE LIFE AND CRACK GROWTH PREDICTION METHODOLOGY

J. C. Newman, Jr., E. P. Phillips, and Richard A. Everett, Jr. *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 13 p (For primary document see N94-34581 10-39)

Copyright Avail: CASI HC A03/MF A03

This paper reviews the capabilities of a plasticity-induced crack-closure model and life-prediction code to predict fatigue crack growth and fatigue lives of metallic materials. Crack-tip constraint factors, to account for three-dimensional effects, were selected to correlate large-crack growth rate data as a function of the effective stress-intensity factor range (Delta K(sub eff)) under constant amplitude loading. Some modifications to the Delta K(sub eff)-rate relations were needed in the near threshold regime to fit small-crackgrowth rate behavior and endurance limits. The model was then used to calculate small- and large-crack growth rates, and in some cases total fatigue lives, for several aluminum and titanium alloys under constant-amplitude, variable-amplitude, and spectrum loading. Fatigue lives were calculated using the crack-growth relations and microstructural features like those that initiated cracks. Results from the tests and analyses agreed well. Author (revised)

N94-34584# National Research Council of Canada, Ottawa (Ontario). Structures and Materials Lab.

CRACK GROWTH PREDICTIONS USING A CRACK CLOSURE MODEL

R. L. Hewitt and P. G. Collins *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 23 p (For primary document see N94-34581 10-39)

Copyright Avail: CASI HC A03/MF A03

Crack growth predictions for through and corner cracks in 7075-T651 plate under constant amplitude loading and corner cracks under two variable amplitude spectra were made using a 'black box' crack closure program. The results were then compared with experiment and various parameters adjusted to give the best match to the experimental results. The optimum parameters chosen will be used for subsequent blind predictions to be made on this material and different but related spectra. Author (revised)

N94-34585# National Aerospace Lab., Amsterdam (Netherlands).

THE CRACK SEVERITY INDEX OF MONITORED LOAD SPECTRA

J. B. deJonge *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 5 p (For primary document see N94-34581 10-39)

Copyright Avail: CASI HC A01/MF A03

To assess the consequences with regard to fatigue and damage tolerance of changes in operational usage, a simple means to quantify the relative severity of recorded load spectra is required. This paper describes the development and validation of the 'Crack Severity Index' CSI as a means to express the relative damage in terms of a 'crack growth potential' of stress spectra. The CSI is based on a crack-closure crack growth model and takes account of interaction effects by considering the shape of the spectrum. It is shown that the CSI-concept is a reasonably accurate method to compare the relative severity of maneuver dominated spectra in aluminum alloy structure. Author (revised)

N94-34586# Pisa Univ. (Italy). Dept. of Aerospace Engineering.
AN ASSESSMENT OF FATIGUE CRACK GROWTH PREDICTION MODELS FOR AEROSPACE STRUCTURES
A. Salvetti, L. Lazzeri, and A. Pieracci *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 17 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

The current state of crack growth prediction models for aerospace applications is reviewed with special reference to limitations and possible improvements. The present work aims at examining the different crack growth prediction models with reference to effective application for practical use (i.e. with the objective of identifying the experimental data necessary to apply the model) and at quantifying the reliability of the different models. Both crack growth prediction models currently used by aerospace industries and prediction methods under development within the scientific community are considered. An experimental program has been carried out to help achieve the objectives. Author (revised)

N94-34587# McDonnell-Douglas Corp., Saint Louis, MO.
A COMBINED APPROACH TO BUFFET RESPONSE ANALYSES AND FATIGUE LIFE PREDICTION
J. H. Jacobs and R. Perez *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 11 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

Experimental measurement and neural network based prediction of wind tunnel model empennage random pressures are discussed. Artificially generated neural network power spectral densities of surface pressures are used to augment existing data and then load an elastic finite element model to obtain response spectra. Details on the use of actual response spectra from flight test data are also discussed. A random spectra fatigue method is described which effectively combines buffet and maneuver loads into a time series based on aircraft usage data. A peak-valley damage analysis procedure is employed to compute the aggregate fatigue life of the structure based on five combined load time series information. Applications of the method as a continual learning tool for buffet response spectra is elaborated. Author (revised)

N94-34588# Deutsche Aerospace A.G., Munich (Germany). Military Aircraft Div.
NOTCH FATIGUE ASSESSMENT OF AIRCRAFT COMPONENTS USING A FRACTURE MECHANICS BASED PARAMETER
Chr. Boller, M. Buderath, P. Heuler, and M. Vormwald *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 16 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

Fatigue life evaluation has been performed for flight-by-flight loaded coupons and real aircraft structural components made of 7075-T7351 using the local strain approach and a fracture mechanics based parameter. Results show that this approach can well compete with the traditionally used nominal stress approach. The advantages are a better understanding of material's fatigue behavior and a less experimental effort required for the determination of baseline data making the local strain approach interesting also for redesign within aircraft mid-life improvement updates. Author

N94-34589# National Aerospace Lab., Bangalore (India).
GROWTH OF ARTIFICIALLY AND NATURALLY INITIATING NOTCH ROOT CRACKS UNDER FALSTAFF SPECTRUM LOADING
R. Sunder, R. V. Prakash, and E. I. Mitchenko *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 12 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

The paper describes an experimental study of notch root fatigue crack growth under FALSTAFF spectrum loading in an Al-Cu alloy. Crack growth rates were measured from crack size as small as 20 microns using optical fractography and replication technique. Fractographic measurements indicate similar scatter levels between notch root short crack and long growth rate data. This is in contrast to surface replica based measurements which are indicative of large scatter. Growth rate variation was noticed between multiple cracks initiating after different periods of natural crack formation. This is attributed to the influence of larger existing cracks on smaller cracks that appear later. In contrast identical artificially initiating cracks grew at a similar rate. Author

N94-34590*# Army Vehicle Structures Lab., Hampton, VA.
ROTORCRAFT FATIGUE LIFE-PREDICTION: PAST, PRESENT, AND FUTURE
Richard A. Everett, Jr. and W. Elber *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 31 p Sponsored by NASA. Langley (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

In this paper the methods used for calculating the fatigue life of metallic dynamic components in rotorcraft is reviewed. In the past, rotorcraft fatigue design has combined constant amplitude tests of full-scale parts with flight loads and usage data in a conservative manner to provide 'safe life' component replacement times. This is in contrast to other industries, such as the automobile industry, where spectrum loading in fatigue testing is a part of the design procedure. Traditionally, the linear cumulative damage rule has been used in a deterministic manner using a conservative value for fatigue strength based on a one in a thousand probability of failure. Conservatism on load and usage are also often employed. This procedure will be discussed along with the current U.S. Army fatigue life specification for new rotorcraft which is the so-called 'six nines' reliability requirement. In order to achieve the six nines reliability requirement the exploration and adoption of new approaches in design and fleet management may also be necessary if this requirement is to be met with a minimum impact on structural weight. To this end a fracture mechanics approach to fatigue life design may be required in order to provide a more accurate estimate of damage progression. Also reviewed in this paper is a fracture mechanics approach for calculating total fatigue life which is based on a crack-closure small crack considerations. Author

N94-34591# Aeronautical Research Inst. of Sweden, Bromma.
FATIGUE MANAGEMENT AND VERIFICATION OF AIRFRAMES **c05**
A. F. Blom and Hans Ansell *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 25 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

The methodology currently used in Sweden for fatigue management and verification of airframes is described. Applications from the new fighter aircraft JAS39 Gripen are included in order to illustrate the various concepts being considered. Additional experience from recent work on the older fighter 37Viggen is also included to highlight certain differences in the detail analyses, stemming from rather different nominal stress levels in the two aircraft. The present paper discusses the handling of load sequences and load spectra development, stress analyses and fracture mechanics analyses, fatigue crack growth modelling, component and full scale testing, service load monitoring regarding both the dedicated test aircraft, which is used to verify basic load assumptions, and also the individual load tracking program developed for the new fighter. Author

N94-34592# Lockheed Aeronautical Systems Co., Marietta, GA.
RISK ANALYSIS OF THE C-141 WS405 INNER-TO-OUTER WING JOINT **c05**
R. E. Alford, R. P. Bell, J. B. Cochran, and D. O. Hammond *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 10 p Presented at the Structural Integrity Program Conference, San Antonio, TX, 2-5 Dec. 1991; sponsored by USAF (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

It is evident that weapon system management benefits greatly from the use of probabilistic risk assessment methods. The C-141 WS 405 inner-to-outer wing joint provides an actual case of how this technology was implemented by Lockheed and USAF engineers to determine conditions of inspection and repair for the C-141 fleet. Author

N94-34593# Dassault-Breguet Aviation, Saint Cloud (France).
ASSESSMENT OF IN-SERVICE AIRCRAFT FATIGUE MONITORING PROCESS **c05**
R. J. Cazes *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 8 p (For primary document

see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

Maintaining the structural integrity of aircraft depends on the initial definition of an inspection program to detect structural damage that may occur in service. Prediction of possible fatigue damage due to the applied loads and conditions of use encountered in service is based on an analysis of the probability of incipient cracks and on an evaluation of the development of undetectable faults assumed to exist between two inspections. The validity of evaluation models is generally demonstrated based on comparisons with results obtained on elementary test pieces subjected to predicted local load conditions in service and used to identify the influence of events such as rare overloads or frequent repetitive small loads. This paper presents the principles for processing in flight signals collected in order to predict structural damage by making in flight integrated calculations, considering influences such as: load signals precision (frequency of points taken); elimination of low amplitude variations; and cycle counting methods for the damage calculation. Author (revised)

N94-34594# Deutsche Aerospace A.G., Munich (Germany). Military Aircraft Div.
THE ROLE OF FATIGUE ANALYSIS FOR DESIGN OF MILITARY AIRCRAFT **c05**
R. Bochmann and D. Weisgerber *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 7 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

A brief overview of the fatigue design method employed at DASA (Deutsche Aerospace AG) for combat aircraft is presented. The efficiency of the fatigue analysis--as embedded in the overall design process--is discussed and compared with full scale testing. Furthermore, possible improvements in the method are suggested. Author (revised)

N94-34595# Wright Lab., Wright-Patterson AFB, OH.
DAMAGE TOLERANCE MANAGEMENT OF THE X-29 VERTICAL TAIL **c05**
J. Harter *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 8 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

During high angle-of-attack (aoa), less than 25 deg, the X-29 experienced severe vertical tail buffet. Fin tip accelerometer data exceeded 110 g's at approximately 16 Hz. The U.S. Air Force Flight Dynamics Directorate was asked to provide technical support to ensure that the entire X-29 flight test program could be safely conducted. The Flight Dynamics Directorate transitioned an in-house developed crack growth life prediction program to the X-29 program office and NASA/Dryden as well as extensive technical support. Three dimensional crack growth analyses were conducted between flight days to track possible damage growth based on actual strain data collected at critical areas of the vertical tail. The entire high aoa flight test program was completed as planned using MODGRO to predict damage accumulation. The data was used to manage flight maneuvers to maximize useful flight data and minimize structural risk. A follow-on flight test program was conducted with the X-29 to assess Vortex Flow Control. Repair to the tail was required to complete this mission. Analysis and verification testing of the repair was performed by the Flight Dynamics Directorate. At the end of that flight test program, less than 10 percent of the repair life was used. Author (revised)

N94-34596# British Aerospace Defence Ltd., Farnborough (England). Military Aircraft Div.
HARRIER 2: A COMPARISON OF US AND UK APPROACHES TO FATIGUE CLEARANCE **c05**
F. S. Perry *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 27 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A01

The different approaches adopted for the fatigue clearance of the Harrier 2 in United States Marine Corps and Royal Air Force usage are discussed. Brief accounts are given of the impact differing analysis methodologies and national airworthiness requirements have had on fatigue design, test, and monitoring of the airframe. Author (revised)

N94-34597# British Aerospace Defence Ltd., Brough (England). Structures Unit.
FATIGUE DESIGN, TEST AND IN-SERVICE EXPERIENCE OF THE BAe HAWK **c05**
John OHara *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 10 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

The BAe Hawk family is designed primarily to UK regulations, including the safe life S-N fatigue philosophy. S-N data pertinent to key structural features was assembled at the design stage, and fatigue coupon/element tests were conducted in confirmation. The Hawk TMk.1 full scale fatigue test (FSFT) has continued to lead the RAF fleet, and the test loading has been validated by a major operational loads measurement (OLM) exercise. Incidents arising on the FSFT or in-service are handled by several approaches including S-N and fracture mechanics calculations, testing, statistical analysis, and modifications and/or routine inspections are introduced when necessary. The development of the fatigue life clearances of the BAe Hawk family is discussed with particular emphasis on the confirmatory testing and in-service loads measurement necessary to ensure and maintain fleet aircraft fatigue life clearance. Author

N94-34598# National Aerospace Lab., Amsterdam (Netherlands).
REDUCTION OF FATIGUE LOAD EXPERIENCE AS PART OF THE FATIGUE MANAGEMENT PROGRAM FOR F-16 AIRCRAFT OF THE RNLAF **c05**
D. J. Spiekhout *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 11 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A03/MF A03

Load monitoring of the F-16 fleet of the RNLAF is carried out by NLR using an electronic device capable of analyzing the signal of a strain gage bridge on one of the main carry through bulkheads. This is done on a sample of the fleet. By making use of the information stored in a large centralized data base system, 'individual airplane tracking' is done. Six times per year, the fatigue damage experience of the fleet is reported to the air staff, expressed in the so called 'crack severity index.' From the measurements it is known that the RNLAF is operating its F-16 fleet in a very damaging way. For this reason, it was decided to investigate the possibilities of how to decrease the severity of flying. In this program much attention has been given to the 'stress per G' relation during a flight. In particular the influence of flying with favorite take off store configurations has been studied. Author (revised)

N94-34599# Lockheed Corp., Fort Worth, TX.
AN OVERVIEW OF THE F-16 SERVICE LIFE APPROACH **c05**
J. W. Morrow and G. T. Herrick *In* AGARD, An Assessment of Fatigue Damage and Crack Growth Prediction Techniques Mar. 1994 9 p (For primary document see N94-34581 10-39)
Copyright Avail: CASI HC A02/MF A03

The F-16 airframe was designed according to the latest USAF philosophy adopted in the 1970s. It has a modular structural arrangement and maximum use has been made of aluminum. It was designed with fracture requirements in mind from its inception. Presented in view-graph format are F-16 requirements for airframe structural durability and safety, F-16 design approach, metals crack growth analysis methodology, fatigue/fracture bulkhead web analysis, test policy comparisons, fatigue and fracture control plan, F-16 force management approach, F-16 fleet management recording systems, and lessons learned. CASI

N94-34722*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
DESIGN ORIENTED STRUCTURAL ANALYSIS
Gary L. Giles Jun. 1994 12 p Proposed for presentation at the Second International Conference on Computational Structures Technology, Athens, Greece, 30 Aug. - 1 Sep. 1994
(RTOP 509-10-11-02)
(NASA-TM-109124; NAS 1.15:109124) Avail: CASI HC A03/MF A01

Desirable characteristics and benefits of design oriented analysis methods are described and illustrated by presenting a synoptic description of the development and uses of the Equivalent Laminated Plate Solution (ELAPS) computer code. ELAPS is a design oriented structural analysis

method which is intended for use in the early design of aircraft wing structures. Model preparation is minimized by using a few large plate segments to model the wing box structure. Computational efficiency is achieved by using a limited number of global displacement functions that encompass all segments over the wing planform. Coupling with other codes is facilitated since the output quantities such as deflections and stresses are calculated as continuous functions over the plate segments. Various aspects of the ELAPS development are discussed including the analytical formulation, verification of results by comparison with finite element analysis results, coupling with other codes, and calculation of sensitivity derivatives. The effectiveness of ELAPS for multidisciplinary design application is illustrated by describing its use in design studies of high speed civil transport wing structures. Author

N94-34348# Nanjing Aeronautical Inst. (China).
OPTIMUM DESIGN OF WIDE FREQUENCY VIBRATION ABSORBERS
Xiao-Zhong Song, Zhen-Qiu Zhou, and Jie Wu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 182-186 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34355# Nanjing Aeronautical Inst. (China). Dept. of Test and Measurement Engineering.
A REAL-TIME 2-D COMPOSITE DAMAGE MONITORING SYSTEM EMPLOYING NEURAL NETWORK
Yun-Gang Tao, Bao-Qi Tao, and Shen-Lin Yu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 211-215 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34367# Nanjing Aeronautical Inst. (China). Dept. of Testing and Measurement Engineering.
PRELIMINARY STUDY OF MEASURING FATIGUE THRESHOLD WITH THE CONTROL OF COMPUTER
Ke-Yin Zhou, Yong-Duan Wu, and Yong-Shang Yi *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 265-267 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34463# Turbomeca S.A. - Brevets Szydlowski, Bordes (France).
VIBRATIONS OF STRUCTURES WITH CYCLIC SYMMETRY: APPLICATION TO THE CASE OF TURBINE ENGINES [VIBRATIONS DE STRUCTURES A SYMETRIE CYCLIQUE: APPLICATION AU CAS DES TURBOMACHINES]
Ludovic Meziere *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 9 p In FRENCH (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A02/MF A04

N94-34464# Pratt and Whitney Aircraft of Canada Ltd., Longueuil (Quebec). Static Structure Dept.
ENGINE STATIC STRUCTURES BEHAVIOUR UNDER IMPACT LOAD USING 3D MODELLING
T. Lucas and K. S. Van *In* AGARD, Technology Requirements for Small Gas Turbines Mar. 1994 22 p Original contains color illustrations (For primary document see N94-34431 10-07)
Copyright Avail: CASI HC A03/MF A04

42 GEOSCIENCES (GENERAL)

N94-34065*# Universities Space Research Association, Huntsville, AL.
SCIENTIFIC COORDINATION OF ACTIVITIES FOR UNIVERSITY PARTICIPATION IN MISSION TO PLANET EARTH Final Report No. 13, 30 Nov. 1990 - 28 Feb. 1994
Michael W. Kalb 28 Feb. 1994 14 p
(Contract NAS8-38782)
(NASA-CR-193947; NAS 1.26:193947) Avail: CASI HC A03/MF A01

This report describes Universities Space Research Association (USRA) activities in support of the University Participation in Mission to Planet Earth. Specifically it addresses the following areas: personnel assigned to the effort, travel, consultant participants, technical progress, and contract spending. Author

43 EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N94-33380 Idaho Univ., Moscow, ID.
MODELLING TOPOGRAPHIC EFFECTS ON DIGITAL REMOTELY SENSED DATA Ph.D. Thesis
Ahmed Fahsi 1993 135 p
Avail: Univ. Microfilms Order No. DA9319334

The topographic effect can produce errors in land cover classification of satellite image data if not accounted for. This effect can cause great variation in spectral responses within the same cover type. Many techniques have been proposed to correct for topography with varying degrees of success. As an outgrowth of the previous efforts, a new model was developed based on existing literature and empirical data analysis of radiometric measurements. It incorporates a number of parameters that relate the geometric configuration of a surface to the sun including, most importantly, the surface slope angle, slope orientation, sun elevation, and sun azimuth. Two types of data were used to evaluate the model. The first consisted of the experimental measurements using a NASA Goddard Space Flight Center radiometer under artificial light and sun radiation. The second data set involved satellite digital Thematic Mapper (TM) data for bands 2, 3, and 4 of a rugged area located on Moscow Mountain in northern Idaho. The testing of the model combined empirical, statistical, and visual analyses of the data. The results obtained in this study showed that the model successfully removed most of the topographic effect. The model reduced the brightness variability within uniform cover types and therefore produced digital images with higher spectral homogeneity. Variability within uniform cover types was reduced by as much as 80 percent after the topographic effects were modeled. The visual analysis not only supported these results but it also showed site-specific corrections for topographic effect, such as equalization of the spectral response of shadowed and sunlit slopes in the pasture and the forested areas while retaining the spectral value of the horizontal surfaces. Dissert. Abstr.

N94-33372 Army Topographic Engineering Center, Fort Belvoir, VA.
A FOUNDATION FOR FUSION
George N. Simcox Mar. 1994 8 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277521) Avail: CASI HC A02

The U.S. Army Topographic Engineering Center (TEC) is a Corps of Engineer laboratory located at Ft. Belvoir, Virginia. Its mission is to perform research and development in the topographic sciences, whatever they may be. Actually, while you can't take a course of study in the topographic sciences, they represent a select grouping of technologies which form a foundation for data fusion on the battlefield. DTIC

N94-33410 Bristol Univ. (England).
SNOWMELT FORECASTING: FURTHER COLD REGIONS DEVELOPMENT OF OPERATIONAL HYDROLOGICAL FORECASTING, VOLUME 1
K. M. Sambles and M. G. Anderson Mar. 1994 350 p Limited

Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAJA45-89-C-0028)
(AD-A278050; R/D-6194-EN-01-Vol-1) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report considers the development of a physically-based distributed model of snowcover dynamics which is able to simulate the pattern of snowcover and snowdepth distribution during the melt season. The validity and sensitivity analysis of the model raise modelling issues that are specific to the model developed. These are concerned with the specific assumptions that the model makes and problems that arise during the model development process. DTIC

N94-33420 Iowa Univ., Iowa City, IA.
APPLICATION OF REMOTE SENSING AND GIS TECHNIQUES FOR ENVIRONMENTAL GEOLOGIC INVESTIGATION, NORTHEAST IOWA
Ph.D. Thesis
Xingzhi Mara Chen 1992 205 p
Avail: Univ. Microfilms Order No. DA9318420

Northeast Iowa, where many localities of shallow ground water contamination are known to occur, was selected for investigation of remote sensing and geographical information system techniques to address environmental geologic questions. The questions include: What is the spatial correlation among the structural factors, bedrock lithology, and sinkholes? How can the susceptibility to ground water contamination of the study area be categorized? What is the spatial relationship between drainage network and sinkholes? Landsat multispectral scanner and thematic mapper imagery proved to be useful in defining and delineating regional landforms, drainage basins, and lithological units based on the tones/colors, textures, drainage patterns, and topographic expressions. Digital image processing of the MSS and TM imagery provided a method for enhancing their spectral signatures. Spatial filtering techniques were especially useful for enhancing the subtle signatures of structural lineaments, which are difficult to delineate through conventional field investigations because of soil and glacial drift cover over the bedrock. Interpretation of enhanced imagery allowed better delineation of the lithological units and structural lineaments than the preliminary interpretation. In analyzing and interpreting the Precambrian basement structural features, statistical transformation of gravity and aeromagnetic data provided an important method for removing local isolated anomalies and delineating regional high anomaly gradient trends. The latter can be related to the basement lineaments. Computer-assisted geographical information system (GIS) was used for manipulation and integration of the geological, remote sensing, and geophysical data in this investigation. The result of the GIS analysis quantitatively verified that areas of high sinkhole density are located in areas of high lineament density and Ordovician carbonate bedrock where the Quaternary sediment cover is thin or absent. The relative susceptibility to ground water contamination in the study area was classified into six classes, based on the quantitative relationship of these geologic factors. In order to reveal the correlation between drainage network and sinkholes, multiple buffering and overlay operations were performed. The result indicated that more sinkholes occur near streams of group level 3. Through this study, it is concluded that the combination of remote sensing and GIS techniques provided a comprehensive approach for integrating environmental information. Dissert. Abstr.

N94-33422 California Univ., Santa Barbara, CA.
COMPARISON OF STANDARD MULTISPECTRAL AND MAP-ASSISTED CLASSIFICATION METHODS WITH A NEW LAYERED APPROACH
Ph.D. Thesis
Kenneth Christian McGwire 1992 204 p
Avail: Univ. Microfilms Order No. DA9317189

This dissertation examines characteristics of spectral response in remote sensing data which affect classification accuracy for land covers in southern California. Imagery from the Thematic Mapper (TM) sensor aboard the Landsat 5 satellite and maps of environmental characteristics are processed to produce a number of land cover maps for two test sites in Santa Barbara County, California. A baseline study is first performed to assess the accuracy of standard classification approaches. The impacts of variability in spectral, spatial, and temporal domains on classification accuracy are then examined on a class specific basis, and a layered classification technique is tested which uses unique spectral variables, environmental indicators, and probability distributions for each land cover class. The hypothesis of this layered approach is that a class specific process will provide better results than traditional methods which assume that all classes are well represented by normal distributions within a single set of spectral measurements. The research described in this dissertation targets specific objectives of earth systems science by addressing requirements for maps of coarse land cover classes to characterize sources and sinks of mass and energy and to quantify the extent of anthropogenic impacts. This study helps to further define the role of historical Landsat data coverage in relation to ongoing and expected data acquisition strategies by documenting the capabilities of TM imagery in data rich study sites. Research investigating the performance of available classification algorithms will identify those areas which require further development, including the best mix of manual and automated approaches. Fundamental work in documenting accuracies and understanding error associated with various classification strategies in selected environments is essential to establish credibility for the use of remote sensing in environmental research which is to support large scale policy making. Dissert. Abstr.

N94-33426 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
PROJECTIVE AND OBJECT SPACE GEOMETRY FOR MONOCULAR BUILDING EXTRACTION
J. C. McGlone and Jefferey A. Shufelt 2 Mar. 1994 28 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contracts DACA76-92-C-0036; DAAH04-93-G-0092)
(AD-A277586; CMU-CS-94-118) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Knowledge about the imaging geometry and acquisition parameters provides useful geometric constraints for the analysis and extraction of man-made features in aerial imagery, particularly in oblique views. In this paper, we discuss the identification of horizontal and vertical lines in the scene using image orientation information, vanishing point calculations, and the calculation of their dimensions. The vertical and horizontal attributions are used to constrain the set of possible building hypotheses. Vertical lines are extracted at corners to estimate structure height and permit the generation of three-dimensional building models from monocular views. Results of these techniques are presented for nadir and oblique imagery and evaluated against manually generated 3D ground truth building models. DTIC

N94-33442 Aerojet Electrosystems Co., Azusa, CA.
THE MULTIPLE SCATTERING CONTRIBUTIONS IN THE STRONG FLUCTUATION THEORY TO THE MICROWAVE BRIGHTNESS TEMPERATURE
Alex Stogryn and Mostafa A. Karam Feb. 1994 51 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-91-C-0140)
(AD-A277721) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This study accounts for the contribution of multiple scattering to microwave brightness temperature of sea ice and its snow cover. The application of the distorted Born approximation in conjunction with the strong fluctuation theory has led to calculated values for brightness temperatures in agreement with measurements from sea ice and its snow cover at frequencies below 37 GHz. However, at frequencies above 37 GHz, the distorted Born approximation overestimates the brightness temperature. This is due to the fact that the distorted Born approximation accounts only for the singly scattered field. Physical and mathematical arguments showed that inclusion of higher order multiple scattering would lead to more reasonable values for the brightness temperature at higher frequencies where the multiple scattering is expected to be dominant. DTIC

N94-33598* Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
A COLLECTION OF THE MOVIES (Videotape)
28 Mar. 1991 Videotape: 21 min. 52 sec. playing time, in color, with sound
(NASA-TM-109806; NONP-VT-94-12934) Avail: CASI VHS A01/BETA A22

This video contains computer-generated animation made from still data

sets processed by computer to give the illusion of flying around the objects. 'Earth the Movie' uses cloud data from satellites and geographical data from maps. 'LA the Movie' was taken from Landsat data of the Los Angeles area. This was the first experimental demonstration of the technology. 'Mars the Movie' was taken from Viking orbiter data. 'Miranda' the Movie was made from a mosaic of 9 frames taken by Voyager of the Uranium moon, Miranda. The last movie is 'Monterey the Bay'. CASI

N94-33748* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.

EOCAP: COMMERCIAL EARTH OBSERVATIONS PROGRAM (Videotape)

[1994] Videotape: 8 min. playing time, in color, with sound

(NASA-TM-109798; NONP-VT-94-12926) Avail: CASI VHS A01/BETA A22

The Earth Observations Commercial Applications Program (EOCAP) is described. This video explains how EOCAP has aided in the development of new and commercial products. CASI

N94-33832 Naval Research Lab., Bay Saint Louis, MS.

DIGITAL MAPPING, CHARTING, AND GEODESY ANALYSIS PROGRAM TECHNICAL REVIEW OF URBAN VECTOR SMART MAP (UV(SUB Map)) PROTOTYPE 1 Final Report

Kevin Shaw, Tom Fetterer, Steve Kuder, Susan Carter, and Jonathan Wright 11 Mar. 1994 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A277831; NRL/MR/7441-93-7080) Avail: CASI HC A03

In an effort to transition from paper to digital maps, the Defense Mapping Agency (DMA) has produced several prototypes that will be used throughout the military (and the final products will likely be used in civilian environments). Some examples are the Digital Chart of the Wodd and Wodd Vector Shoreline. As part of the prototyping procedure, DMA via N096 regularly requests the Naval Research Laboratory's Digital Mapping, Charting, and Geodesy Analysis Program for evaluations of the prototypes. Described in this report are the results of the evaluation of one such prototype: the Urban Vector Smart Map (UVMap). Digitized from city graphics and stored on Compact Disk-Read Only Memory, UVmap, shows potential as being an excellent source of high-resolution, easily accessible (under proper classification restraints) urban data. Implementation of the suggestions will enhance UVMap's capabilities. DTIC

N94-33938# Westinghouse Savannah River Co., Aiken, SC.

AERIAL ROBOTIC DATA ACQUISITION SYSTEM

K. J. Hofstetter, D. W. Hayes, M. M. Pendergast, and J. E. Corban 1993 6 p Presented at the International Conference on Methods and Applications of Radioanalytical Chemistry, Kona, HI, 10-16 Apr. 1994

(Contract DE-AC09-89SR-18035)

(DE94-009114; WSRC-MS-93-453; CONF-940401-2) Avail: CASI HC A02/MF A01

A small, unmanned aerial vehicle (UAV), equipped with sensors for physical and chemical measurements of remote environments, is described. A miniature helicopter airframe is used as a platform for sensor testing and development. The sensor output is integrated with the flight control system for real-time, interactive, data acquisition and analysis. Preprogrammed flight missions will be flown with several sensors to demonstrate the cost-effective surveillance capabilities of this new technology. DOE

N94-33948*# Woods Hole Research Center, MA.

COMPLETING BELOW-GROUND CARBON BUDGETS FOR PASTURES, RECOVERING FORESTS, AND MATURE FORESTS OF AMAZONIA Annual Status Report No. 1, 1 Aug. 1993 - 31 May 1994

Eric A. Davidson, Daniel C. Nepstad, and Susan E. Trumbore 1994 5 p

(Grant NAGw-3748)

(NASA-CR-195959; NAS 1.26:195959) Avail: CASI HC A01/MF A01

The objective of this grant was to complete below-ground carbon budgets for pastures and forest soils in the Amazon. Profiles of radon and carbon dioxide were used to estimate depth distribution of CO2 production in soil. This information is necessary for determining the importance of deep roots as sources of carbon inputs. Samples were collected for measuring root biomass from new research sites at Santana de Araguaia and Trombetas. Soil gases will be analyzed for CO2 and (14)CO2, and soil organic matter will be analyzed for C-14. Estimates of soil texture from the RADAMBRASIL database were merged with climate data to calculate soil water extraction by forest canopies during the dry season. In addition, a preliminary map of areas where deep roots are needed for deep soil water was produced. A list of manuscripts and papers prepared during the reporting periods is given. CASI

N94-34018*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

THE PAYLOAD ADVISORY PANEL AND THE DATA AND INFORMATION SYSTEM ADVISORY PANEL OF THE INVESTIGATORS WORKING GROUP OF THE EARTH OBSERVING SYSTEM: A JOINT REPORT

Berrien Moore, III (New Hampshire Univ., Durham.), Jeff Dozier (California Univ., Santa Barbara, CA.), Eric J. Barron (Pennsylvania State Univ., State College.), Getulio Batista (Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil.), Peter Brewer (Monterey Bay Aquarium Research Inst., Pacific Grove, CA.), William Grose, Graham Harris, Dennis Hartmann, William Lau, and John LeMarshall et al 17 Dec. 1993 99 p Panel held in Herndon, VA, 4-6 Oct. 1993 Prepared in cooperation with New Hampshire Univ., Durham; California Univ., Santa Barbara, CA; Pennsylvania State Univ., State College; INPE, San Jose dos Campos, Brazil; Monterey Bay Aquarium Research Inst., Pacific Grove, CA; CSIRO, Canberra, Australia; Washington Univ., Seattle; NASA. Goddard Research Center; and Bureau of Meteorology, Melbourne, Australia

(NASA-TM-109847; NAS 1.15:109847) Avail: CASI HC A05/MF A02

The Payload Advisory Panel of the Investigators Working Group (IWG) for the Earth Observing System (EOS) met 4 to 6 October 1993 in Herndon, Virginia. The Panel, originally composed of the Interdisciplinary Science Principal Investigators, was expanded to include all Principal Investigators and as such is now the IWG itself. The meeting also addressed directly a report from the EOS Data and Information System (EOSDIS) Advisory Panel. The meeting focused on payload issues in the years 2000 to 2005; however, some subjects in the nearer-term, most significantly EOSDIS, were considered. The overarching theme of convergence in Earth observations set a backdrop for the entire meeting. Other themes included: atmospheric chemistry; remote sensing of the global cycles of energy, water, and carbon in EOS; ocean and land-ice altimetry; and the EOSDIS. The Totol Solar Irradiance Monitoring Report and results from the Accelerated Canopy Chemistry Program are included as appendices.

Derived from text

N94-34114# Technische Univ., Delft (Netherlands). Faculteit der Geodesie.

NORMAL MATRIX IN GRAVITY FIELD DETERMINATION WITH SATELLITE METHODS. ITS STABILIZATION, ITS INFORMATION CONTENT AND ITS USE IN ERROR PROPAGATION

J. Bouman, R. Rummel, R. J. J. Koop, and N. J. Sneeuw Aug. 1993 94 p See also N89-26305

(PB94-149705) Avail: CASI HC A05/MF A01

One of the aims of geodesy is the determination of the earth's gravity field outside its surface, sometimes referred to as the geodetic boundary value problem (gbvp). Better knowledge of the gravity field in terms of geoid height is important in local and global applications, like leveling with global positioning system (GPS), height datum problems, and connection of leveling networks overseas. But better geoid heights are also of interest in oceanographical science, e.g. determination of currents with the help of satellite altimetry data. A further improvement of the knowledge of the gravitational field will contribute to precise satellite orbit determination, too. Also in geophysical applications the gravity field is important. The underlying method discussed in this work is also used in the determination of gravity fields of other planets like that of Venus and in geophysical inverse problems. NTIS

N94-34115# Technische Univ., Delft (Netherlands). Faculteit der Geodesie.

ERROR ANALYSIS OF THE STEP DRAG-FREE SYSTEM WITH RESPECT TO GRAVITY FIELD DETERMINATION

J. C. Kester Aug. 1993 80 p

(PB94-149804) Avail: CASI HC A05/MF A01

In the satellite geodesy the gravity potential of the earth is determined

from orbit analysis. For this purpose the potential is written as Fourier series along the orbit, periodicity is obtained once the satellite in its orbit and the orbit relative to an earth-fixed frame both have made an integer number of revolutions. The partial derivatives of the gravity potential are coupled with displacements in the satellite's position by means of the Hill equations. The displacements are measured with global positioning system (GPS) positioning. A model can be derived that couples the GPS measurements with the potential coefficients. The satellite is also subject to non-conservative forces, like air-drag. The non-conservative forces are deterministic noise for the (satellite geodesy) model that determines potential coefficients from GPS position measurements. A drag-free system aboard of the STEP satellite measures these disturbances and produces a contraforce by means of helium thrusters. By so doing, most of the drag is cancelled, but the system is not perfect, there remains a residual acceleration. The spectrum of this drag-free noise is continuous. The error spectrum of the potential coefficients is computed from the total of the GPS measurement noise and the drag-free noise and is presented in the thesis. NTIS

N94-34134*# Hydex Corp., Vienna, VA.
REMOTE SENSING OF HYDROLOGIC VARIABLES IN BOREAL AREAS, PHASE 1 Final Report, Apr. 1993 - Apr. 1994
Eugene L. Peck and Thomas R. Carroll Mar. 1994 23 p
(Contract NAS5-32336)
(NASA-CR-195812; H-355; NAS 1.26:195812) Avail: CASI HC A03/MF A01

The major effort by HYD-6 members has been to develop a network of flight lines to provide the maximum amount of information on the temporal and spatial variation in soil moisture for the Boreal Ecosystem Atmosphere Study (BOREAS) study areas. Field visits to the southern study area (SSA) were conducted during May 1993 to obtain first hand information on the flight lines that had been previously selected for BOREAS snow studies. In September 1993 airborne gamma radiation surveys were conducted over the SSA, the northern study area (NSA), and for five flight lines along the transect between the two study areas. In situ measurements of soil moisture and water content of the moss/humus layer were obtained for calibration of selected gamma radiation flights lines in the SSA and for two of the transit lines. The flight lines for which soil moisture will be measured during the three IFC's during the summer of 1994 is a subset of the total flight lines that have been flown for the snow surveys. During the WFC in February 1994, airborne gamma radiation surveys were flown over all of the flight lines. Members of HYD-4 collected in-situ measurements (soil moisture, water content of the moss/humus layer, and water equivalent of the snow cover). Derived from .ext

N94-34214*# Colorado Univ., Boulder, CO. Center for Astrodynamics Research.
SOME ASPECTS OF SIMULTANEOUSLY FLYING TOPEX FOLLOW-ON IN A TOPEX ORBIT WITH GEOSAT FOLLOW-ON IN A GEOSAT ORBIT Final Report
Michael E. Parke, George Born, and Craig McLaughlin 4 May 1994 10 p
(Grant NAG1-1506)
(NASA-CR-196075; NAS 1.26:196075) Avail: CASI HC A02/MF A01

The advantages of having Geosat Follow-On in a Geosat orbit flying simultaneously with Topex Follow-On in a Topex/Poseidon orbit are examined. The orbits are evaluated using two criteria. The first is the acute crossover angle. This angle should be at least 40 degrees in order to accurately resolve the slope of sea level at crossover locations. The second is tidal aliasing. In order to solve for tides, the largest constituents should not be aliased to a frequency lower than two cycles/year and should be at least one cycle discrete from one another and from exactly two cycles/year over the mission life. The results show that TFO and GFO in these orbits complement each other. Both satellites have large crossover angles over a wide latitude range. In addition, the Topex orbit has good aliasing characteristics for the M2 and P1 tides for which the Geosat orbit has difficulty. Author

N94-34223# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF THE IHS TRANSFORMATION USE ON THE INTEGRATION OF GEOPHYSICAL (AEROMAGNETOMETRY) AND REMOTE SENSING (TM-LANDSAT) DATA FOR THE GEOLOGICAL INVESTIGATION IN THE POJUCA AREA (SERRA DOS CARAJAS, PA) M.S. Thesis [AVALIACAO DO USO DA TRANSFORMACAO IHS NA INTEGRACAO DE DADOS GEOFISICOS AEROMAGNETOMETRIA E DE SENSORIAMENTO REMOTO TM-LANDSAT PARA A INVESTIGACAO GEOLOGICA NA AREA DO POJUCA, SERRA DOS CARAJAS, PA]
Silvia Beatriz Alves Rolim Dec. 1993 131 p In PORTUGESE
(INPE-5532-TDI/521) Avail: CASI HC A07/MF A02

The Amazon region has very few geological surveys, in spite of having several mineral districts. The relationship between geology, relief, soils, and vegetation cover is poorly investigated. This lack of knowledge is caused by many factors, such as the nonaccessibility to the area, its environmental complexity, the absence of systematic and integrated multidisciplinary studies, etc. These problems can be partially solved by the use of remote sensing and geophysical data. In this context, the present study was based on the extraction of geological information from the digital integration of remote sensing (Landsat-TM) and geophysical (magnetometry) data, using the IHS transform. In order to perform this research, the following data were analyzed: digital magnetic images (reduction to magnetic equator and pole, magnetic susceptibility, first and second derivatives, upward continuation) obtained from total field image, derived from aerial profiles; TM-Landsat-5 images (six reflective bands); aerial photographs; and geological and geobotanical maps. The geophysical data (N-S profiles) were converted to a regular grid of 30 m and subsequently to a black and white digital image with a cubic spline interpolation algorithm. These images were integrated with TM-images in the IHS space, in order to improve a better correlation between geological and geophysical information. A photogeological map was done in order to compare the IHS results and to improve the geological knowledge of the Pojuca test area. The IHS transform combined the first principal component of the six reflective Landsat bands (intensity channel) and the reduction to magnetic equator transformed image (hue channel). The final product provides additional information on the textural and topographical features (principal components) 'colored' by the magnetic patterns. In addition, the IHS transform confirmed many existing geobotanical classes in the study area. Author (revised)

N94-34226# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
GEOMORPHOLOGICAL MAP OF THE REGION OF THE PARAIBA VALLEY AND THE NORTHERN COASTAL ZONE OF SAO PAULO STATE [MAPA GEOMORFOLOGICO DA REGIAO DO VALE DO PARAIBA E LITORAL NORTE DO ESTADO DE SAO PAULO]
Teresa Gallotti Florenzano and Sonia Margarida Csordas Nov. 1993 21 p In PORTUGESE
(INPE-5531-PRP/179) Avail: CASI HC A03/MF A01

This paper presents the geomorphological map of the region of the Paraiba Valley and the northern coastal zone of Sao Paulo State. The objective of this study is to provide geomorphological information for regional land use planning. LANDSAT-TM images (1:250,000), panchromatic aerial photographs (1:60,000), as well as topographic maps (1:50,000 and 1:250,000) were analyzed to produce the geomorphological map which emphasized the morphological aspects of the study region. The IPT's geomorphological legend for the Sao Paulo State was modified and used in this study. Author (revised)

N94-34230# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STRATIFICATION OF DEFORESTED AREAS BY VEGETATION TYPES IN AMAZONIA, USING GEOGRAPHIC INFORMATION SYSTEMS: STUDY OF CASE AT SB20 PURUS MAP M.S. Thesis [ESTRATIFICACAO DE AREAS DESFLORESTADAS POR TIPOS DE VEGETACAO DA AMAZONIA, UTILIZANDO SISTEMA DE INFORMACOES GEOGRAFICAS: ESTUDO DE CASO NA FOLHA SB20 PURUS]
Jussara Dolfini deOliveira Nov. 1993 129 p In PORTUGESE
(INPE-5541-TDI/529) Avail: CASI HC A07/MF A02

A methodology to stratify deforested areas by Amazonia vegetation

types, using geoprocessing techniques was tested for SB20 Purus map. The approach concerns the integration of different scales and projections data, so two datasets were considered: deforestation and vegetation maps from Landsat/TM imagery (1:250,000 scale and UTM projection) and RadamBrasil vegetation map (1:1,000,000 scale and Lambert Conformal Conic projection). These datasets were integrated using Geographic Information Systems (GIS), producing as results the stratification of deforested areas by vegetation types and the relationship between the two vegetation datasets. The adopted method made possible the proposed objective and the results showed that about 91 percent of forested areas had been equally classified in both of products. However, it was possible to verify that about 2.95 percent of forested areas in RadamBrasil were classified as non-forested in Amazonia project, and it was a sign of differences in thematic classification, as well as in the position of the equivalents features. The occurrence of 9.59 percent of deforestation in RadamBrasil nonforested areas was an evidence of these differences that could be confirmed with Landsat/TM imagery. A qualitative analysis of the results suggested application of the methodology to the whole Amazonia, but the analysis must be done individually. These results made possible too, considering some important aspects to future works that have been interested in anthropogenic emissions of greenhouse gases using deforested areas related to biomass and RadamBrasil vegetation maps. Author

N94-34268*# National Aeronautics and Space Administration, Washington, DC.
LOOKING AT EARTH FROM SPACE: DIRECT READOUT FROM ENVIRONMENTAL SATELLITES
Jan. 1994 17 p
(NASA-EP-300; NAS 1.19:300) Avail: CASI HC A03/MF A01

Direct readout is the capability to acquire information directly from meteorological satellites. Data can be acquired from NASA-developed, National Oceanic and Atmospheric Administration (NOAA)-operated satellites, as well as from other nations' meteorological satellites. By setting up a personal computer-based ground (Earth) station to receive satellite signals, direct readout may be obtained. The electronic satellite signals are displayed as images on the computer screen. The images can display gradients of the Earth's topography and temperature, cloud formations, the flow and direction of winds and water currents, the formation of hurricanes, the occurrence of an eclipse, and a view of Earth's geography. Both visible and infrared images can be obtained. This booklet introduces the satellite systems, ground station configuration, and computer requirements involved in direct readout. Also included are lists of associated resources and vendors. Derived from text

N94-34382# Sandia National Labs., Albuquerque, NM.
A SAR IMAGE-FORMATION ALGORITHM THAT COMPENSATES FOR THE SPATIALLY-VARIANT EFFECTS OF ANTENNA MOTION
B. L. Burns and J. T. Cordaro 1994 12 p Presented at the Society of Photo-Optical Instrumentation Engineers Conference on Intelligent Information Systems, Orlando, FL, 4-8 Apr. 1994
(Contract DE-AC04-94AL-85000)
(DE94-008456; SAND-93-2125C; CONF-940449-5) Avail: CASI HC A03/MF A01

A synthetic aperture radar (SAR) obtains azimuth resolution by combining data from a number of points along a specified path. Uncompensated antenna motion that deviates significantly from the desired path produces spatially-variant errors in the output image. The algorithm presented in this paper corrects many of these motion-related errors. In this respect, it is similar to time-domain convolution, but it is more computationally efficient. The algorithm uses overlapped subapertures in a three-step image-formation process: coarse-resolution azimuth processing, fine-resolution range processing, and fine-resolution azimuth processing. Range migration is corrected after the first stage, based on coarse azimuth position. Prior to the final azimuth-compression step, data coordinates, are determined to fine resolution in range and coarse resolution in azimuth. This coordinate information is combined with measured motion data to generate a phase correction that removes spatially-variant errors. The algorithm is well-suited for real-time applications, particularly where large flight-path deviations must be tolerated. DOE

N94-34369# Ufa State Technical Aviation Univ. (Russia)
THE MODELLING OF THE OCEAN SURFACE IMAGE IN OPTICAL REMOTE SENSING
S. T. Kusimov, B. G. Ilyasov, V. H. Bagmanov, and A. H. Sultanov *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 271-274 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

N94-33724# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
NREL PREPRINTS FOR THE 23RD IEEE PHOTOVOLTAIC SPECIALISTS CONFERENCE
M. Fitzgerald, ed. May 1993 129 p Presented at the 23rd IEEE Photovoltaic Specialists Conference, Louisville, KY, 10-14 May 1993 Submitted for publication
(Contract DE-AC02-83CH-10093)
(DE93-010027; NREL/TP-410-5582; CONF-930540) Avail: CASI HC A07/MF A02

Topics covered include various aspects of solar cell fabrication and performance. Aluminium-gallium arsenides, cadmium telluride, amorphous silicon, and copper-indium-gallium selenides are all characterized in their applicability in solar cells. DOE

N94-33726# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
THE POTENTIAL IMPACT OF EXTERNALITIES CONSIDERATIONS ON THE MARKET FOR BIOMASS POWER TECHNOLOGIES
B. G. Swezey, K. L. Porter, and J. S. Feher Feb. 1994 59 p
(Contract DE-AC02-83CH-10093)
(DE94-000247; NREL/TP-462-5789) Avail: CASI HC A04/MF A01

This study assesses the current status of externalities considerations--nonmarket costs and benefits--in state and utility electricity resource planning processes and determines how externalities considerations might help or hinder the development of biomass power plants. It provides an overview of biomass resources and technologies, including their market status and environmental impacts; reviews the current treatment of externalities in the states; and documents the perspectives of key utility, regulatory, and industry representatives concerning externalities considerations. The authors make the following recommendations to the biomass industry: (1) the wood and agricultural waste industries should work toward having states and utilities recognize that wood and agricultural waste are greenhouse gas neutral resources because of carbon sequestration during growth; (2) the biomass industry should emphasize nonenvironmental benefits such as economic development and job creation; and (3) the biomass industry should pursue and support efforts to establish renewable energy set-asides or 'green' requests for proposals. DOE

N94-33727# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
CATARACT: COMPUTER CODE FOR IMPROVING POWER CALCULATIONS AT NREL'S HIGH-FLUX SOLAR FURNACE
K. Scholl, C. Bingham, and A. Lewandowski Jan. 1994 6 p Presented at the ASME International Solar Energy Conference, San Francisco, CA, 27-30 Mar. 1994
(Contract DE-AC02-83CH-10093)
(DE94-000267; NREL/TP-471-5543; CONF-940326-6) Avail: CASI HC A02/MF A01

The High-Flux Solar Furnace (HFSF), operated by the National Renewable Energy Laboratory, uses a camera-based, flux-mapping system to analyze the distribution and to determine total power at the focal point. The flux-mapping system consists of a diffusively reflecting plate with seven

circular foil calorimeters, a charge-coupled device (CCD) camera, an IBM-compatible personal computer with a frame-grabber board, and commercial image analysis software. The calorimeters provide flux readings that are used to scale the image captured from the plate by the camera. The image analysis software can estimate total power incident on the plate by integrating under the 3-dimensional image. Because of the physical layout of the HFSF, the camera is positioned at a 20 angle to the flux mapping plate normal. The foreshortening of the captured images that results represents a systematic error in the power calculations because the software incorrectly assumes the image is parallel to the camera's array. We have written a FORTRAN computer program called CATARACT (camera/target angle correction) that we use to transform the original flux-mapper image to a plane that is normal to the camera's optical axis. A description of the code and the results of experiments performed to verify it are presented. Also presented are comparisons of the total power available from the HFSF as determined from the flux mapping system and theoretical considerations. DOE

N94-34070# Sandia National Labs., Albuquerque, NM.
STATUS OF PHOTOVOLTAIC CONCENTRATOR MODULES AND SYSTEMS
A. B. Maish 1994 6 p Presented at the American Solar Energy Society Conference, San Jose, CA, 25-30 Jun. 1994
(Contract DE-AC04-94AL-85000)
(DE94-009281; SAND-94-0813C; CONF-9406134-1) Avail: CASI HC A02/MF A01

Several leading line- and point-focus photovoltaic concentrator system development programs are reviewed, including those by ENTECH, SEA Corporation, AMONIX, and Alpha Solarco. Concentrating collectors and trackers are gaining maturity and reaching product status as designs are made more manufacturable and reliable. Utilities are starting to take notice of this emerging technology, and several privately-funded utility installations are underway. Several advantages are offered by concentrators, including low system and capital cost and rapid production ramp-up. These are discussed along with issues generally raised concerning concentrator technology. DOE

N94-34078# Malcolm (David) Associates, Inc., Mississauga (Ontario).
A USER'S MANUAL FOR THE PROGRAM TRES4: RANDOM VIBRATION ANALYSIS OF VERTICAL-AXIS WIND TURBINES IN TURBULENT WINDS
Mar. 1994 40 p Prepared for Sandia National Labs., Albuquerque, NM
(Contract DE-AC04-94AL-85000)
(DE94-009012; SAND-93-7015) Avail: CASI HC A03/MF A01

TRES4 is a software package that works with the MSC/NASTRAN finite element analysis code to conduct random vibration analysis of vertical-axis wind turbines. The loads on the turbine are calculated in the time domain to retain the nonlinearities of stalled aerodynamic loadings. The loads are transformed into modal coordinates to reduce the number of degrees of freedom. Power spectra and cross spectra of the loads are calculated in the modal coordinate system. These loads are written in NASTRAN Bulk Data format to be read and applied in a random vibration analysis by NASTRAN. The resulting response is then transformed back to physical coordinates to facilitate user interpretation. DOE

N94-34088# Lawrence Livermore National Lab., CA.
MULTI-UNIT INERTIAL FUSION ENERGY (IFE) PLANTS PRODUCING HYDROGEN FUEL
B. G. Logan Dec. 1993 11 p Presented at the 10th World Hydrogen Energy Conference, Cocoa Beach, FL, 20-24 Jun. 1994
(Contract W-7405-eng-48)
(DE94-007241; UCRL-JC-115786; CONF-940620-1) Avail: CASI HC A03/MF A01

A quantitative energy pathway comparison is made between a modern oil refinery and genetic fusion hydrogen plant supporting hybrid-electric cars powered by gasoline and hydrogen-optimized internal combustion engines, respectively, both meeting President Clinton's goal for advanced car goal of 80 mpg gasoline equivalent. The comparison shows that a fusion electric plant producing hydrogen by water electrolysis at 80% efficiency must have an electric capacity of 10 GWe to support as many hydrogen-powered hybrid cars as one modern 200,000 bbl/day-capacity oil refinery could support in gasoline-powered hybrid cars. A 10 GWe fusion electric plant capital cost is limited to $12.5 billion to produce electricity at 2.3 cents/kWehr, and hydrogen production by electrolysis at $8/GJ, for equal consumer fuel cost per passenger mile as in the oil-gasoline-hybrid pathway. DOE

N94-34139# Brookhaven National Lab., Upton, NY.
HYNOL: AN ECONOMIC PROCESS FOR METHANOL PRODUCTION FROM BIOMASS AND NATURAL GAS WITH REDUCED CO2 EMISSION
M. Steinberg and Yuanji Dong Oct. 1993 25 p
(Contract DE-AC02-76CH-00016)
(DE94-008872; BNL-49733) Avail: CASI HC A03/MF A01

The Hynol process is proposed to meet the demand for an economical process for methanol production with reduced CO2 emission. This new process consists of three reaction steps: (1) hydrogasification of biomass, (2) steam reforming of the produced gas with additional natural gas feedstock, and (3) methanol synthesis of the hydrogen and carbon monoxide produced during the previous two steps. The H2-rich gas remaining after methanol synthesis is recycled to gasify the biomass in an energy neutral reactor so that there is no need for an expensive oxygen plant as required by commercial steam gasifiers. Recycling gas allows the methanol synthesis reactor to perform at a relatively lower pressure than conventional while the plant still maintains high methanol yield. Energy recovery designed into the process minimizes heat loss and increases the process thermal efficiency. If the Hynol methanol is used as an alternative and more efficient automotive fuel, an overall 41% reduction in CO2 emission can be achieved compared to the use of conventional gasoline fuel. A preliminary economic estimate shows that the total capital investment for a Hynol plant is 40% lower than that for a conventional biomass gasification plant. The methanol production cost is $0.43/gal for a 1085 million gal/yr Hynol plant which is competitive with current U.S. methanol and equivalent gasoline prices. Process flowsheet and simulation data using biomass and natural gas as cofeedstocks are presented. The Hynol process can convert any condensed carbonaceous material, especially municipal solid waste (MSW), to produce methanol. DOE

N94-34165 Midwest Research Inst., Kansas City, MO.
MINIPILOT SOLAR SYSTEM: DESIGN/OPERATION OF SYSTEM AND RESULTS OF NON-SOLAR TESTING AT MRI Final Report, Jul. 1991 - Sep. 1992
P. Gorman, E. Ball, J. Jones, and P. Murowchick Dec. 1993 98 p
Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract EPA-68-D0-0137)
(PB94-152238; EPA/600/R-94/027) Avail: Issuing Activity (National Technical Information Service (NTIS))

A Minipilot Solar Reactor System (MSRS) with liquid organic feed was designed, constructed, and tested without solar input (the Solar Tests were to be done later at DOE's National Renewable Energy Laboratory). The non-solar tests were done to determine whether use of EPA's sampling and analysis methods would allow quantitation of the expected significantly lower organic emissions when the MSRS is operated with solar input. Results of the 10 tests showed that it should be possible to determine if there is a significant reduction in emissions when operating with solar input. Such reduction in the emissions should be determinable for two of the principal constituents contained in the synthetic feed liquid (CC4 and DCB), for both the volatile and semivolatile products of incomplete combustion (PIC's) and for dioxins and furans. However, reductions are probably not determinable for the other two feed constituents (toluene and naphthalene). Results also showed that a three-fold reduction in volatile PIC's occurred in both single-chamber tests when an artificial UV light was utilized. NTIS

N94-34167# Solar Kinetics, Inc., Dallas, TX.
DETAIL DESIGN OF A 10.4-m STRETCHED-MEMBRANE DISH
Jan. 1994 176 p Prepared for Sandia National Labs., Albuquerque, NM
(Contract DE-AC04-94AL-85000)
(DE94-009462; SAND-94-0095) Avail: CASI HC A09/MF A02

This report describes efforts conducted under Tasks 3 and 4 of the second phase of the project to develop a single-element stretched-membrane dish concept to reduce the cost of a high-performance concentrating solar collector. We completed the detailed design for such a collector suitable to drive a 25-kWe Stirling motor generator. The design includes the collectors,

optical element, the drive, and support systems. The aperture of the optical element was sized to provide the required energy to the engine based on test data and analytical models of the concentrator receiver and engine. The design of the optical element was improved based on experience gained from the design, fabrication, and testing of several prototypes.
DOE

N94-34279*# EIC, Inc., Norwood, MA.
NEAR-AMBIENT SOLID POLYMER FUEL CELL Final Report, 21 Jan. - 20 Jul. 1993
G. L. Holleck 10 Aug. 1993 38 p
(Contract NASw-4788)
(NASA-CR-195939; NAS 1.26:195939) Avail: CASI HC A03/MF A01

Fuel cells are extremely attractive for extraterrestrial and terrestrial applications because of their high energy conversion efficiency without noise or environmental pollution. Among the various fuel cell systems the advanced polymer electrolyte membrane fuel cells based on sulfonated fluoropolymers (e.g., Nafion) are particularly attractive because they are fairly rugged, solid state, quite conductive, of good chemical and thermal stability and show good oxygen reduction kinetics due to the low specific adsorption of the electrolyte on the platinum catalyst. The objective of this program is to develop a solid polymer fuel cell which can efficiently operate at near ambient temperatures without ancillary components for humidification and/or pressurization of the fuel or oxidant gases. During the Phase 1 effort we fabricated novel integral electrode-membrane structures where the dispersed platinum catalyst is precipitated within the Nafion ionomer. This resulted in electrode-membrane units without interfacial barriers permitting unhindered water diffusion from cathode to anode. The integral electrode-membrane structures were tested as fuel cells operating on H2 and O2 or air at 1 to 2 atm and 10 to 50 C without gas humidification. We demonstrated that cells with completely dry membranes could be self started at room temperature and subsequently operated on dry gas for extended time. Typical room temperature low pressure operation with unoptimized electrodes yielded 100 mA/cm(exp 2) at 0.5V and maximum currents over 300 mA/cm(exp 2) with low platinum loadings. Our results clearly demonstrate that operation of proton exchange membrane fuel cells at ambient conditions is feasible. Optimization of the electrode-membrane structure is necessary to assess the full performance potential but we expect significant gains in weight and volume power density for the system. The reduced complexity will make fuel cells also attractive for smaller and portable power supplies and as replacement for batteries.
Derived from text

45 ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

N94-33421 California Univ., Santa Barbara, CA.
ENVIRONMENTAL MODELING WITH GIS: A STRATEGY FOR DEALING WITH SPATIAL CONTINUITY Ph.D. Thesis
Karen Kathleen Kemp 1992 243 p
Avail: Univ. Microfilms Order No. DA9317174

Linking a GIS to a spatially distributed physically based environmental model offers many advantages. However, the implementation of such linkages is generally problematic. Many problems arise because the relationship between the reality being represented by the mathematical model and the data model used to organize the spatial data in the GIS has not been rigorously defined. In particular, while many environmental models are based on theories that assume continuity and incorporate physical fields as independent variables, current GIS's can only represent continuous phenomena in a variety of discrete data models. This document develops and outlines a strategy in which field variables are used to enable modelers to work directly with the spatial data as spatially continuous phenomena. Field variables are declared like other data types in standard computing languages. Specifications of field variables include several special properties which are used to express the relationship between the physical field and the discrete data model. These properties determine how the spatial data can be manipulated. This allows the manner in which the spatial data has been discretized and the ways in which it can be manipulated to be treated independently from the conceptual modeling of physical processes. Several outcomes from the use of this strategy are explored. Modelers can express their spatial data needs as representations of reality rather than as elements of a GIS database, and a GIS-independent language for model development results. By providing a formal linkage between the various models of spatial phenomena, a mechanism is created for the explicit expression of transformation rules between the models of spatial data stored and manipulated by GIS. The incorporation of field variables allows several operations (such as determining integrals, slope, and aspect) and reserved variables (such as latitude and longitude) which are commonly used in environmental models to be defined. While scalar fields are the focus of this document, consideration of the potential for the definition of vector fields and related operations (such as divergence and gradient) using this strategy is also included. Dissert. Abstr.

N94-33546# Industrial Coll. of the Armed Forces, Washington, DC.
TRANSNATIONAL ENVIRONMENTAL DEGRADATION Report, Aug. 1992 - Apr. 1993
Gary J. Thurston Apr. 1993 39 p
(AD-A278469; NDU-ICAF-93-RS12) Avail: CASI HC A03/MF A01

My paper discusses environmental issues which transcend national boundaries. A description of these issues is presented from a non-scientist, big picture point of view. My views are expressed as to how these environmental issues relate to United States national security, especially considering the world population growth doubling in the next sixty years. After discussing current environmental policies, I recommend future environmental policies. DTIC

N94-33551* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
OZONE HOLE AIRBORNE ARCTIC STRATOSPHERIC EXPEDITION (PRE-FLIGHT) (Videotape)
Feb. 1989 Videotape: 7 min. playing time, in color, with sound
(NASA-TM-109800; NONP-VT-94-12928) Avail: CASI VHS A01/BETA A22

Ozone research done in the Antarctic region is detailed. CASI

N94-33553 Air Force Environmental Technical Applications Center, Scott AFB, IL.
UPPER-AIR QUALITY CONTROL: A COMPARISON STUDY
David J. Speltz Dec. 1993 30 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277884; USAFETAC/PR-93/006) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This study compares the output of the upper-air quality control (QC) methods used by the Air Force Global Weather Central (AFGWC) with those of the National Meteorological Center (NMC). AFGWC uses the new upper-air validator (NUAV), while NMC uses the complex QC procedure for rawinsonde heights and temperatures (CQCHT). This study identifies advantages, disadvantages, and added value of each QC scheme. DTIC

N94-33692# Lawrence Livermore National Lab., CA.
APPLICATION OF PULSED PLASMA NO(x) REDUCTION TO DIESEL ENGINE EXHAUST
P. H. Wallman, B. M. Penetrante, G. E. Vogtlin, and M. C. Hsiao 11 Oct. 1993 8 p Presented at the 1993 Diesel Emission Reduction Workshop, La Jolla, CA, Jul. 1993
(Contract W-7405-eng-48)
(DE94-007454; UCRL-JC-114931; CONF-9307164-2) Avail: CASI HC A02/MF A01

We have studied the effect of pulsed plasma discharges on gas mixtures simulating diesel engine exhaust by modeling and by experiment. Our modeling results have shown that the pulsed plasma can convert NO(x) to N2 using the nitrogen itself as a reductant. However, this process is energetically unfavorable for the plasma regime of our measurements. In our experiments we found that addition of hydrocarbons improves substantially the energy efficiency of pulsed plasma NO(x) reduction. Real exhaust gas contains some gaseous hydrocarbons and carbon monoxide that may prove sufficient for improving the energy efficiency of the 'right' pulsed plasma reduction process. DOE

N94-33696*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

A USERS' GUIDE TO THE TRACE CONTAMINANT CONTROL SIMULATION COMPUTER PROGRAM

J. L. Perry Apr. 1994 41 p

(NASA-TM-108456; NAS 1.15:108456) Avail: CASI HC A03/MF A01

The Trace Contaminant Control Simulation computer program is a tool for assessing the performance of various trace contaminant control technologies for removing trace chemical contamination from a spacecraft cabin atmosphere. The results obtained from the program can be useful in assessing different technology combinations, system sizing, system location with respect to other life support systems, and the overall life cycle economics of a trace contaminant control system. The user's manual is extracted in its entirety from NASA TM-108409 to provide a stand-alone reference for using any version of the program. The first publication of the manual as part of TM-108409 also included a detailed listing of version 8.0 of the program. As changes to the code were necessary, it became apparent that the user's manual should be separate from the computer code documentation and be general enough to provide guidance in using any version of the program. Provided in the guide are tips for input file preparation, general program execution, and output file manipulation. Information concerning source code listings of the latest version of the computer program may be obtained by contacting the author. Author

N94-33712# East Anglia Univ., Norwich (England). Climatic Research Unit.

DETECTION OF GREENHOUSE-GAS-INDUCED CLIMATIC CHANGE

T. M. L. Wigley and P. D. Jones Jul. 1993 26 p

(Contract DE-FG02-86ER-60397)

(DE94-004636; DOE/ER-60397/T7) Avail: CASI HC A03/MF A01

The aims of the US Department of Energy's Carbon Dioxide Research Program are to improve assessments of greenhouse-gas-induced climatic change and to define and reduce uncertainties through selected research. The main research areas covered by this proposal are First Detection and Supporting Data. The project will also include work under Modeling: specifically, analysis of climate forcing factors, the development and refinement of transient response climate models, and the use of instrumental data in validating General Circulating Models (GCM's). DOE

N94-33714# Colorado State Univ., Fort Collins, CO. Dept. of Atmospheric Science.

DEVELOPMENT OF A RADIATIVE CLOUD PARAMETERIZATION SCHEME OF STRATOCUMULUS AND STRATUS CLOUDS WHICH INCLUDES THE IMPACT OF CCN ON CLOUD ALBEDO

W. R. Cotton 18 Jan. 1994 15 p

(Contract DE-FG02-90ER-61066)

(DE94-005476; DOE/ER-61066/T3) Avail: CASI HC A03/MF A01

The objective of this research is to develop a parameterization scheme that is able to dispose or predict changes in stratocumulus cloud cover, atmospheric boundary layer (ABL) stability, liquid water paths (LWP's), and cloud albedo due to changes in sea-surface temperatures, large scale vertical motion and wind shear, and cloud condensation nuclei (CCN). The motivation for developing such a parameterization scheme is that it is hypothesized that anthropogenic sources of CCN can result in increased concentrations of cloud droplets. The higher concentrations of CCN result in higher concentrations of cloud droplets, thereby enhancing cloud albedo which in the absence of other effects will induce a climate forcing opposed to that associated with 'greenhouse' warming. As a result of the complicated interactions between cloud microstructure, cloud macrostructure, and cloud radiative transfer, only a limited range of clouds are susceptible to changes in CCN concentrations causing changes in cloud albedo. It is the intent of this research to determine the range of cloud types that are susceptible to albedo changes by anthropogenic CCN and incorporate that information into a cloud parameterization scheme. DOE

N94-33715# Geological Survey, Menlo Park, CA.

VOLCANIC GAS EMISSIONS AND THEIR EFFECT ON AMBIENT AIR CHARACTER

A. J. Sutton and T. Elias 1994 26 p

(Contract DE-AI05-93OR-22089)

(DE94-005675; DOE/OR-22089/1; USGS-OFR-93-551-E) Avail: CASI HC A03/MF A01

This bibliography was assembled to service an agreement between Department of Energy and the USGS to provide a body of references and useful annotations for understanding background gas emissions from Kilauea volcano. The current East Rift Zone (ERZ) eruption of Kilauea releases as much as 500,000 metric tonnes of SO2 annually, along with lesser amounts of other chemically and radiatively active species including H2S, HCl, and HF. Primary degassing locations on Kilauea are located in the summit caldera and along the middle ERZ. The effects of these emissions on ambient air character are a complex function of chemical reactivity, source geometry and effusivity, and local meteorology. Because of this complexity, we organized the bibliography into three main sections: (1) characterizing gases as they leave the edifice; (2) characterizing gases and chemical reaction products away from degassing sources; and (3) Hawaii Island meteorology. DOE

N94-33718# Lawrence Livermore National Lab., CA.

ENVIRONMENTAL PROCESS TOMOGRAPHY IN THE UNITED STATES

W. Daily and A. Ramirez Jan. 1994 14 p Presented at the ECAPT 1994: Third European Concerted Action Meeting on Process Tomography, Lisbon, Portugal, 24-27 Mar. 1994

(Contract W-7405-eng-48)

(DE94-006402; UCRL-JC-115468; CONF-940342-2) Avail: CASI HC A03/MF A01

The US Government is supporting development of new technology and transfer of existing technology from other disciplines to apply to the problem. Part of this effort is development of geophysical tools used for underground imaging. These tools are closely related to many of those used in industrial process tomography. Both seismic and electromagnetic methods are used for underground imaging. In either case, sensitivity and resolution are greatly improved by making measurements from boreholes instead of only from the surface. Seismic signals are usually more sensitive to subsurface structure such as lithologic boundaries, but recent work has also shown seismic tomography to be sensitive to the degree of saturation. Electrical methods can be useful for delineation of aquitards such as clay layers. Electrical tomography is shown to be particularly sensitive to movement of fluids such as steam. Examples of both seismic and electromagnetic process tomography will be discussed in relation to environmental remediation of soils and ground water in the United States. DOE

N94-33725# North Dakota Univ., Grand Forks, ND. Energy and Environmental Research Center.

AIR QUALITY ASSESSMENT AND CONTROL

S. J. Miller, D. L. Laudal, and M. K. Heidt Jul. 1993 23 p

(Contract DE-FC21-93MC-30097)

(DE94-000046; DOE/MC-30097/3516) Avail: CASI HC A03/MF A01

Emissions of fine particles are of concern because these particles can be deposited in the lower respiratory system through normal breathing. The potential problem is further compounded because hazardous trace elements, such as selenium and arsenic, are known to be concentrated on such fine particles. Control device removal efficiency is lowest for respirable particles, so the potentially most hazardous particles from coal combustion are collected with the lowest removal efficiency. Therefore, a current need exists to develop superior, but economical, methods to control emissions of air toxic particulate matter. One approach is to model the relationships between the cohesive properties of fly ash and particulate collector performance in electrostatic precipitators (ESP's) and fabric filters. In ESP's, a balance between good dust release and minimum redispersion must be achieved for optimum ESP fine-particle collection efficiency. To achieve high fine-particle collection efficiency with fabric filters, the large pores in the fabric must be adequately bridged, and reentrainment must be kept to a minimum while still allowing for adequate dust cake release. However, the defining relationships between cohesive dust properties and particulate collector performance have not been adequately developed. Therefore, the goal of the Fine Particulate Control Project is the development of methods to measure the cohesive strength and reentrainment potential of fly ashes and to model emissions of fine particles based on these measurements. A long-term project goal is to develop the models to the point where they can be used to help design particulate control devices for the lowest level of fine-particle emissions at a reasonable cost. DOE

N94-33736# Lawrence Livermore National Lab., CA.

CO2 IMPULSE RESPONSE CURVES FOR GWP CALCULATIONS

A. K. Jain and D. J. Wuebbles 26 Oct. 1993 5 p
(Contract W-7405-eng-48)
(DE94-004277; UCRL-ID-115333) Avail: CASI HC A01/MF A01

The primary purpose of Global Warming Potential (GWP) is to compare the effectiveness of emission strategies for various greenhouse gases to those for CO2, GWP's are quite sensitive to the amount of CO2. Unlike all other gases emitted in the atmosphere, CO2 does not have a chemical or photochemical sink within the atmosphere. Removal of CO2 is therefore dependent on exchanges with other carbon reservoirs, namely, ocean and terrestrial biosphere. The climatic-induced changes in ocean circulation or marine biological productivity could significantly alter the atmospheric CO2 lifetime. Moreover, continuing forest destruction, nutrient limitations or temperature induced increases of respiration could also dramatically change the lifetime of CO2 in the atmosphere. Determination of the current CO2 sinks, and how these sinks are likely to change with increasing CO2 emissions, is crucial to the calculations of GWP's. It is interesting to note that the impulse response function is sensitive to the initial state of the ocean-atmosphere system into which CO2 is emitted. This is due to the fact that in our model the CO2 flux from the atmosphere to the mixed layer is a nonlinear function of ocean surface total carbon. DOE

N94-33915# Lawrence Livermore National Lab., CA.
EFFECTS OF ELEVATED ATMOSPHERIC CO2 CONCENTRATIONS AND WATER STRESS ON FIELD-GROWN MAIZE
K. A. Surano, ed. and J. R. Kercher, ed. Oct. 1993 102 p
(Contract W-7405-eng-48)
(DE94-009636; UCRL-ID-115637) Avail: CASI HC A06/MF A02

Global atmospheric carbon dioxide (CO2) concentrations are continuing to increase and will probably double during the next century. The effects of such an increase are of global concern. Carbon dioxide-induced climate changes may result in reduced precipitation in major agricultural areas. The potential therefore exists for severe CO2-induced water-stress effects on agriculture. This set of studies determined the effects of long-term elevated atmospheric CO2 concentrations and severe water stress on biomass production, evapotranspiration, water-use efficiency (WUE), water potential, photosynthesis, stomatal conductance, morphology, and phenology of maize grown under field conditions. Plants were grown at one of four daytime mean CO2 concentrations (348, 431, 506, or 656 mu LL(exp -1)) in open-top field exposure chambers and at one of two levels of available water (well-watered or 50% of well-watered). This report is organized into four chapters followed by appendices. Separate abstracts were prepared for each of the four chapters: biomass production and water-use efficiency, gas exchange and water potential, morphology and phenology, and elemental analyses. DOE

N94-33963 Industrial Coll. of the Armed Forces, Washington, DC.
ENVIRONMENTAL PROTECTION: CAN WE AFFORD IT? Research Report, Aug. 1992 - Apr. 1993
Terry A. Yonkers Apr. 1993 44 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278298; NDU-ICAF-93-S87) Avail: CASI HC A03

In the past two decades, annual U.S. expenditures for pollution control have increased dramatically. The trend is for even greater private and governmental expenditures as emphasis shifts from domestic to global environmental protection concerns. Intensive Congressional oversight coupled with elaborate governmental regulations and policies are making it difficult for businesses (and governmental entities) to meet strict environmental standards -- compliance cost and environmental liability are becoming pivotal to business decisions. Our economic stability is weakening as businesses close down, cut back, or relocate. This paper looks at how much the U.S. is spending on environmental protection and considers the benefits derived from the dollars invested, discusses some of the impacts resulting from strict environmental regulation, and offers some options to alleviate the negative consequences of current U.S. environmental policies. DTIC

N94-33986# Oak Ridge National Lab., TN.
GREENHOUSE GAS EMISSIONS RELATED TO ETHANOL PRODUCED FROM CORN
G. Marland 1994 5 p Presented at the Renewable Oxygenate Requirement for Reformulated Gasoline Meeting, Arlington, VA, 14 Jan. 1994
(Contract DE-AC05-84OR-21400)
(DE94-009170; CONF-940175-1) Avail: CASI HC A01/MF A01

This report confers the details of a panel meeting discussion on greenhouse gases. The topic of this discussion was ethanol. Members discussed all aspects of growing corn and producing ethanol. Then the question was raised as to whether or not this is a suitable substitute to fossil fuel usage in the reduction of greenhouse gas emissions. DOE

N94-34009# Sandia National Labs., Albuquerque, NM.
AUTOMATED CLEANING OF ELECTRONIC COMPONENTS
W. Drotning 1994 9 p Presented at the International Symposium on Electronics and the Environment, San Francisco, CA, 2-6 May 1994
(Contract DE-AC04-94AL-85000)
(DE94-008742; SAND-94-0519C; CONF-940599-1) Avail: CASI HC A02/MF A01

Environmental and operator safety concerns are leading to the elimination of trichloroethylene (TCE) and chlorofluorocarbon (CFC) solvents in electronic component cleaning processes that remove rosin flux, organic and inorganic contamination, and particulates. Present processes depend heavily on these solvents for manual spray cleaning of small components and subassemblies. Use of alternative solvent systems can lead to longer processing times and reduced quality. Automated spray cleaning can improve the quality of the cleaning process, thus enabling the productive use of environmentally conscious materials, while minimizing personnel exposure to hazardous materials. In addition, the use of robotic and automated systems can reduce the manual handling of parts that necessitates additional cleaning. We describe the development of a prototype robotic system for cleaning electronic components in a spray cleaning workcell. An important feature of the prototype system is the capability to generate the robot paths and motions automatically from the CAD models of the part to be cleaned, and to embed cleaning process knowledge into the automatically programmed operations. DOE

N94-34116# Environmental Protection Agency, Ann Arbor, MI. Office of Mobile Sources.
EMISSION CONTROL TECHNOLOGY FOR DIESEL TRUCKS (DRAFT) Report to Congress
Oct. 1993 57 p See also PB94-108016
(PB94-150455) Avail: CASI HC A04/MF A01

This report provides an overview of the various technologies being developed to meet the exhaust emission standards for diesel engines. Each technology is evaluated for its potential emission control benefits, as well as its cost and effect on fuel economy and durability. NTIS

N94-34222 Institute of Energy Economics of Japan.
TRENDS IN WORKING ON THE FRAMEWORK CONVENTION ON CLIMATE CHANGE IN INDUSTRIALIZED COUNTRIES IN EUROPE AND AMERICA
11 Nov. 1993 34 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE94-757292; ETDE/JP-mf-94757292) Avail: CASI HC A03

This paper is an extract from the report on the investigation of substitute energies and global environment, the global warming problem, and energy demand and supply carried out by NEDO in 1992. The report covers the Framework Convention on Climate Change, responses from America and EC, and the joint implementation. The treaty has been ratified by Japan, the U.S.A., and China, and is expected to go into force in the beginning of 1994. Response from the U.S.A., who accounts for about 25% of the world's energy consumption and CO2 emission, is represented by the pledge of the Clinton administration to stabilize the consumption and emission in 2000, and by the announcement of the Climate Change Action Plan. The Btu tax has ended in no success. The EC has responded only to CO2, with a prospect of stabilization at +3% level in 2000. This assumption is subject to the carbon/energy taxation system, but difficulty is being encountered in this respect. Germany estimates on its own the emission in 2005 at about -30% of the 1987 level, but the estimation depends largely on reduction efforts in the west German area. Achieving the EC's target would be difficult. The 'Joint Implementation' of INC that intends to reduce the international cost would consume a considerably large amount of time before an agreement is reached between industrialized nations and developing nations. DOE

N94-34224 New Energy and Industrial Technology Development Organization, Tokyo (Japan).
INVESTIGATION ON OPTIMIZATION OF CARBON DIOXIDE PROCESSING SYSTEM AND EFFECTIVE UTILIZATION TECHNIQUE OF CARBON
Mar. 1992 132 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE94-757426; NEDO-ITE-9112) Avail: CASI HC A07

With a view to manufacture carbon material from coal and to utilize this material, the present conditions of its manufacturing technique and utilization, the curtailment effects of carbon dioxide, etc. were investigated. Polycyclic aromatic compounds may be used as carbon material of coal, but their effective use has not been realized because the separation and purification technique for obtaining high-purity isomers has not been developed yet. Possible manufacture of high-polymer material and fine chemicals having heat-resistance, conductivity, optical functionality of liquid crystals, etc. is being studied. When these materials are marketed at ten thousand yen/kg or so, only light-sensitive resin and carbon fibers manufactured at the scale of ten thousand t/year are commercialized. However, if they can be sold at a low unit price (several hundred yen/kg) of the conventional heat-resistant resin, the greatest possible demand of four million tons will occur. Generated amount of carbon dioxide was compared between the case where coal is fueled and the case where the market exists for intermediate products. The generated amount of carbon dioxide per ten thousand yen of the value added was about 1300 kg and about 200 kg respectively. DOE

N94-34225# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY OF THE ENERGY PARTITION IN COMPLEX TERRAINS (DEFORESTED AND FORESTED AREAS) Ph.D. Thesis [ESTUDO DA PARTICAO DE ENERGIA EM TERRENOS COMPLEXOS AREAS DESLORESTADAS E FLORESTAS]
Regina Celia dosSantosAlvala 1993 165 p In PORTUGESE
(INPE-5522-TDI/519) Avail: CASI HC A08/MF A02

The conversion of tropical forested areas into pastures may cause significant microclimatic consequences. To evaluate them, it is necessary to model the micrometeorology of the forest canopy and the substituting pasture, with parameterizations that adequately involve all relevant processes. Thus, a model based on the iterative solution of the energy balance equation was developed for the determination of the surface temperature for days without rain, both for forested and deforested (pasture) areas. The following input data were used: global solar radiation fluxes, wind velocity, and air and soil temperatures as well as physical and photometric soil and canopy properties, including the maximum and minimum stomatal resistances of the vegetation. The estimated resulting fluxes are verified against observational data obtained during micrometeorological experiments in the central tropical Amazonian 'terra firme' forest region. The sites consisted of Reserva Ducke (2 deg 57 min S; 59 deg 57 min W) for forest and, for pasture, Fazenda Dimona (2 deg 19 min S; 60 deg 19 min W). Despite some minor discrepancies, all simulated components of the energy balance agreed well with the observed data. In addition, the same agreement occurred with micrometeorological scales for momentum, heat, and water vapor. These results show that the model, with few parameters, for days without rain, allows the evaluation of the energy partition, both for pastures and for forest canopies in the Amazonian 'terra firme' region. Author (revised)

N94-34402# TRC Environmental Consultants, Inc., Chapel Hill, NC.
ANALYSIS OF AMBIENT MONITORING DATA IN THE VICINITY OF OPEN TIRE FIRES
Jul. 1993 99 p
(Contract EPA-68-D0-0121)
(PB94-156197; EPA/453/R-93/029) Avail: CASI HC A05/MF A02

The report documents the collection of air monitoring data, much of which is unpublished, from 22 actual tire fire emergencies. An exploratory analysis revealed that several types of summary statistics may be appropriate, if the air monitoring data were divided into those measurements taken at less than 1000 feet from the edge of the tire fire and those taken at greater than 1000 feet. The report is organized into three major components: executive summary, detailed report, and appendices. NTIS

N94-34409 Research Triangle Inst., Research Triangle Park, NC.
TOXIC EMISSIONS FROM AIRCRAFT FIREFIGHTING TRAINING: A SEARCH OF AVAILABLE LITERATURE
Jul. 1993 63 p Sponsored by EPA Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-156783; EPA/453/R-93/027) Avail: CASI HC A04

The document attempts to compile citations and brief descriptions of studies and data regarding toxic air emissions released during training exercises for firefighting at airports. Many training exercises use real aviation fuels (JP4, JP5...) to simulate real fire conditions. The burning of such fuels also causes the release of toxic combustion by-products. Such practices have raised concerns about the public health effects of the combustion by-products. Little is known about the emission characteristics of such burning. The purpose of the work is to find what recent data are available on the toxic and volatile organic compound (VOC) emissions and on health effects from open burning of aviation fuels. NTIS

N94-34685*# New Hampshire Univ., Durham. Complex Systems Research Center.
GLOBAL CHANGES IN BIOGEOCHEMICAL CYCLES IN RESPONSE TO HUMAN ACTIVITIES Final Report
Berrien Moore, III and Jerry Melillo May 1994 21 p Original contains color illustrations
(Grant NAGw-714)
(NASA-CR-191896; NAS 1.26:191896) Avail: CASI HC A03/MF A01; 7 functional color pages

The main objective of our research was to characterize biogeochemical cycles at continental and global scales in both terrestrial and aquatic ecosystems. This characterization applied to both natural ecosystems and those disturbed by human activity. The primary elements of interest were carbon and nitrogen and the analysis sought to quantify standing stocks and dynamic cycling processes. The translocation of major nutrients from the terrestrial landscape to the atmosphere (via trace gases) and to fluvial systems (via leaching, erosional losses, and point source pollution) were of particular importance to this study. Our aim was to develop the first generation of Earth System Models. Our research was organized around the construction and testing of component biogeochemical models which treated terrestrial ecosystem processes, aquatic nutrient transport through drainage basins, and trace gas exchanges at the continental and global scale. A suite of three complementary models were defined within this construct. The models were organized to operate at a 1/2 degree latitude by longitude level of spatial resolution and to execute at a monthly time step. This discretization afforded us the opportunity to understand the dynamics of the biosphere down to subregional scales, while simultaneously placing these dynamics into a global context. Derived from text

N94-33460*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
COMPARISON OF THE IMPACT OF VOLCANIC ERUPTIONS AND AIRCRAFT EMISSIONS ON THE AEROSOL MASS LOADING AND SULFUR BUDGET IN THE STRATOSPHERE
Glenn K. Yue and Lamont R. Poole *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 481-495 (For primary document see N94-33447 10-02)
Avail: CASI HC A03/MF A04

N94-35060*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A STATISTICAL INFERENCE APPROACH FOR THE RETRIEVAL OF THE ATMOSPHERIC OZONE PROFILE FROM SIMULATED SATELLITE MEASUREMENTS OF SOLAR BACKSCATTERED ULTRAVIOLET RADIATION
N. L. Bonavito, C. L. Gordon, R. Inguva, G. N. Serafino, and R. A. Barnes *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence 207-222 (SEE N94-35043 10-63) May 1994 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

N94-33358 Colorado Univ., Boulder, CO.
TOMOGRAPHIC IMAGING OF INTERNAL EARTH STRUCTURE: THE CORE-MANTLE BOUNDARY AND THE TRADE-OFF BETWEEN VOLUMETRIC AND TOPOGRAPHIC STRUCTURE Ph.D. Thesis
Arthur James Rodgers, Jr. 1993 133 p
Avail: Univ. Microfilms Order No. DA9320473

The arrival times of seismic body waves reported to the International Seismological Centre (ISC) were inverted to infer the laterally varying radius of the core-mantle boundary (CMB). The data selection and processing methods are described and evaluated. The ISC global core phase travel time data are very noisy. The geographic distribution of the data is highly nonuniform. We show that for PcP data the coherent signal due to mantle heterogeneity overshadows that arising from the CMB, and that the effects of mantle heterogeneity are mapped into the inferred CMB solutions. Several multivariate statistical techniques were developed to model the residual variance. One such technique was used to infer a correlation length of the spatially averaged data on a two dimensional surface. The PcP data are not correlated across the spatial averaging bins and seem to have a strong bias due to small-scale structure and/or noise. Spatial patterns of CMB models inferred from different phases do not agree. Amplitudes of seismically inferred CMB undulations vary greatly. The sensitivity of inferred CMB models to the processing, spatial averaging procedure, and inversion techniques are investigated. Based on this work, it is concluded that reliable inference of CMB topography is not likely with the current ISC data set or with a spherical harmonic expansion truncated to degree and order six. A synthetic travel time inversion experiment was performed to evaluate the effect of unmodeled 660-km discontinuity topography on the inference of aspherical, volumetric mantle structure. Kernels relating the travel times of seismic body-waves to perturbations in discontinuity radius were derived. The results of these inversions show that significant smearing of the input topographic signal appears in the models of volumetric mantle structure inferred from the synthetic data. Recovery of the input signal improves when solving for higher order radial structure with smooth polynomials or with thinner shells directly below 660 km depth. However, fundamental differences between the kernels for volumetric and topographic structure restrict recovery of the input signal to approximately 80 percent.
Dissert. Abstr.

N94-33361 Oregon Graduate Inst. of Science and Technology, Beaverton, OR.
MODEL CALCULATIONS OF RADIATIVE TRANSFER AND TROPOSPHERIC CHEMISTRY Ph.D. Thesis
Yu Lu 1993 309 p
Avail: Univ. Microfilms Order No. DA9320332

The tropospheric chemistry of HO(x), NO(y), O(x), and CH(i)O(j) were studied with our time-dependent multiple one-dimensional photochemical model. Besides its diurnal, vertical, seasonal, and latitudinal variations, the globally averaged OH level may decrease by about 40 percent from ice ages to the present and about 10 percent from the pre-industrial era to the present. However, the averaged nighttime OH in ice ages is about three times as large as the current nighttime OH, 1.3 x 10(exp 4) molecules/cm(exp 3), which is about two orders of magnitude smaller than the averaged daytime OH, 1.6 x 10(exp 6) molecules/cm(exp 3), at present. By tracing the reactions, which are initiated by the direct reactions of OH with CO and CH4, the total effects of CH4 and CO were calculated. Atmospheric methane, along with its feedbacks, may remove as much as or more atmospheric OH than carbon monoxide, although CO is widely accepted as the largest sink of the atmospheric OH. A detailed radiative transfer model was developed for various atmospheric conditions by including the optical properties and other physical features of various types of clouds and aerosols. The model results indicates the variations of the synoptic and environmental conditions in the lower atmosphere affect not only the actinic fluxes locally but also the radiation field in the upper atmosphere. Finally coupling the radiative transfer model with the photochemical model shows the effect of aerosols on OH chemistry becomes important only in the atmospheric boundary layer. The OH concentrations could drop significantly below a cloud but increase above the cloud compared to the OH levels in a clear atmosphere. The averaged OH level for the whole troposphere could be increased by low clouds but decreased by high clouds. More importantly, the increase of tropospheric OH by low clouds could be larger than that due to stratospheric O3 depletion.
Dissert. Abstr.

N94-33368 Columbia Univ., New York, NY.
MANTLE MELTING AND CRUSTAL RECYCLING IN SUBDUCTION ZONES Ph.D. Thesis
Terry Ann Plank 1993 463 p
Avail: Univ. Microfilms Order No. DA9318276

Major element data for basalts from approximately 100 arc volcanoes are examined in order to test a model whereby the mantle melts to varying extents beneath different arcs. Because the downgoing plate is at a fairly constant depth (approximately 120 km) beneath arc volcanoes worldwide, the total length of the mantle column that is available for adiabatic melting is largely dependent on the thickness of the arc crust. Chemical parameters that reflect the degree of mantle melting might then correlate with crustal thickness. Major element data for arc basalts are corrected for the effects of differentiation by calculating values at 6 percent MgO. Na(6.0) and Ca(6.0) correlate strongly with the thickness of the arc crust: basalts erupted onto thick crust are rich in Na and poor in Ca. These characteristics are typical of low degree mantle melts. Thus, where the crust is thick, the mantle melting column is short and the mantle melts to a small extent, producing high Na and low Ca melts. Mantle melting variations can also explain the variations in some trace elements (e.g., Sc, Ce, Zr) but others (e.g., Ba, K, Sr) may reflect subducted sediment instead. In order to test the sediment subduction model, sediment fluxes into trenches are estimated. Over 250 new chemical analyses are reported for marine sediments from DSDP/ODP Sites 765, 595, 596, and 183. Based on evaluation of these reference sites, relationships are found between the geochemical and lithologic variations in sediments. This lithologic approach is used to calculate the bulk composition for eight trench sections (Java, Tonga, Aleutians, Antilles, Guatemala, Mexico, Vanuatu, and Marianas). The sediment input fluxes correlate well with the associated arc enrichments in K, Rb, Cs, Sr, Ba, U, and Th for the eight arc/trenches pairs examined. The subducted input and volcanic output fluxes can be balanced if the entire oceanic crust (sediment + basalt) loses elements to the arc. The results of this flux balance are that the sediment loses roughly 10-30 percent of all the elements to the arc, while the basalt loses more variable amounts (0 percent, 2.5 percent, 7-15 percent, and 30 percent of its Th, U, alkalis, and Ba, respectively). The relatively constant proportions from the sediment suggest that the transport phase to the mantle wedge is a sediment melt, while the variable proportions from the basalt suggest an aqueous fluid. In this model, elements are recycled in subduction zones via sediment melting and basalt dehydration.
Dissert. Abstr.

N94-33369 Colorado Univ., Boulder, CO.
ARCTIC RADIATIVE FLUXES MODELED FROM THE ISCCP-C2 DATA SET, 1983 - 1986 Ph.D. Thesis
Axel Juergen Schweiger 1992 219 p
Avail: Univ. Microfilms Order No. DA9318133

In order to quantify the Arctic radiation balance for large-scale process studies such as sea ice modeling experiments, as well as for comparison with GCM modeling studies, we have to rely on satellite remote sensing techniques which provide the only source of data with sufficient spatial and temporal coverage. The International Satellite Cloud Climatology Project (ISCCP) data set provides the opportunity to calculate radiative forcing fields. The uncertainty in some of the ISCCP variables is evaluated through comparisons with other available data sets. ISCCP cloud statistics are compared to a surface based climatology. Satellite cloud amounts are generally 5-35 percent less than the surface observations over the entire Arctic. However, regional differences may be as high as 45 percent. During July the surface-based cloud amounts for the central Arctic are about 40 percent greater than the satellite-based but only 10 percent greater in the Norwegian Sea area. Surprisingly, in winter ISCCP cloud climatology and surface observations agree better than during summer and ISCCP cloud amounts even exceed surface observations in the central Arctic. Radiative effects of ice crystal precipitation may be responsible for this. Surface temperatures reported in the ISCCP algorithm appear to be overestimates (4 K). Values of surface reflectance are underestimates and derived albedos

are too low by up to 0.1. A method for computing radiative fluxes over the Arctic Ocean from the ISCCP data set using a radiative transfer modeling approach is developed. Monthly radiative fluxes and cloud forcings at the surface and at the top of the atmosphere are calculated for the period 1983-1986. Shortwave radiative fluxes agree within 15 Wm(exp -2) with those reported in the climatology from Russian drifting stations. Differences in downwelling longwave fluxes during summer are substantial and are in part due to the fact that the ISCCP summer cloud amount are underestimates. Upwelling top of the atmosphere radiative fluxes appear reasonably accurate (within 20 Wm(exp -2)) when compared with Earth Radiation Budget Experiment (ERBE) measurements. Experiments with a dynamic/thermodynamic sea ice model using radiative forcing fields calculated from the ISCCP data produce ice thickness fields that are consistent with expected values. Dissert. Abstr.

N94-33416 California Univ., Los Angeles, CA.
ON THE ULF WAVES IN THE EARTH'S DAYSIDE MAGNETOSPHERE Ph.D. Thesis
Ming Cao 1993 285 p
Avail: Univ. Microfilms Order No. DA9319804

The theory of ULF waves in the Earth's magnetosphere has three major predictions: the existence of the continuous shear Alfven spectrum which corresponds to the field line resonance with spatially varying frequencies; the existence of the discrete compressional Alfven spectrum which corresponds to the magnetospheric cavity mode with spatially independent eigenfrequencies; and the coupling between the two modes and the cavity eigenmode may be regarded as steady state driving source of field line resonance. Substantial evidence for the existence of field line resonance has been reported in many papers. The existence and significance of global modes in the magnetospheric cavity and the coupling between these two modes are of considerable current interest. This dissertation describes an investigation of ULF waves, predominantly in the Pc 3-4 frequency band, in the dayside magnetosphere. It can be divided into two parts. The first part presents two statistical studies of ULF wave phenomena in the earth's dayside magnetosphere. The occurrence rate statistics revealed two important facts. The first fact is the difference in occurrence rate distributions of Pc 3, Pc 4, and Pc 5 waves. Pc 3 and Pc 4 occurs mostly in a region around the local noon. Pc 5 occurs mostly in the dawn and dusk flank regions. The second fact is that the 'magnetopause normalization' had obvious effects on sharpening the patterns of Pc 3-4 occurrence. It demonstrates the effect of the dynamic magnetosphere on the wave distributions. The second statistical study is done by integrating wave power in the Pc 3-4 wave frequency bands. Our results show that most of the Pc 3-4 wave power is concentrated in the noon and afternoon region. This result agrees with the Alfven wave asymmetry between the morning and afternoon regions. In the second part of the dissertation, we studied two special type of ULF waves: linearly polarized waves and the compressional global cavity mode waves. We demonstrated that a substantial part of the Pc 3-4 waves observed in the earth's dayside magnetosphere are linearly polarized. Chapter five demonstrated some exciting new results. We report a special case of global mode waves observed by multiple spacecraft simultaneously. Two important features were observed. The short 'setting up' time tells us that energy can be transported quickly and effectively by compressional fast mode waves in the system. The short 'damping out' time tells us that this is a low Q system. To keep the cavity mode waves running in such a system, a continuos energy source is needed. The energy source was likely to have been the upstream broadband perturbations. Our work is an initial step in the direction of supplying needed evidences to the second and the third theoretical predictions. Dissert. Abstr.

N94-33440 Naval Research Lab., Washington, DC.
CATALOG AND ATLAS FROM A SENSITIVE 1.5 GHz RADIO SURVEY AROUND THE NORTH ECLIPTIC POLE
P. L. Hertz, R. I. Kollgaard, M. M. Chester, E. D. Feigelson, and W. Brinkman 28 Feb. 1994 173 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277705; NRL/MR/7621-94-7439) Avail: CASI HC A08

A 29.3 square degree region surrounding the north ecliptic pole (NEP) is mapped with the very large array (VLA) at 1.5 GHz to support the deepest portion of the ROSAT all-sky soft x ray survey. A total of 114 fields were mapped, and radio sources with peak brightnesses exceeding approximately six times the field's root-mean-square noise were identified. The resulting VLA-NEP survey catalog contains 2435 radio sources with flux densities in the range of 0.3 - 1000 mJy, including over 200 fainter than 1 mJy. We present here the VLA-NEP survey catalog, suggested counterparts for approximately 18% of the VLA-NEP objects, and an atlas of an 114 survey fields with catalogued sources indicated. In an appendix we present initial scientific analysis of the VLA-NEP survey. The catalog and related tables are available electronically. DTIC

N94-33537 Radiomana, Paris (France).
INVESTIGATIONS ON LOCAL SEISMIC PHASES AND MODELING OF SEISMIC SIGNALS Final Report, 1 Sep. 1990 - 31 Aug. 1993
B. Massinon and P. Mechler 31 Oct. 1993 125 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0356-90)
(AD-A277891; PL-TR-94-2007) Avail: CASI HC A06

During this three years period of activity we have worked on the basic topic of our grant that is to say 'Investigations on local seismic phases and modeling of seismic signals' but we have also enlarged this research in some cases to teleseismic distances. We also worked on data processing of seismic waves recorded at regional distances by a mini-array in order to improve the capability of automatic detection and localization of events. Within the frame of the study of regional phases, we have used methods of numerical simulation to model data from the french and spanish seismic networks in order to study the influence of crustal heterogeneities on the attenuation of these phases. DTIC

N94-33544# Wyoming Univ., Laramie, WY. Dept. of Physics and Astronomy.
TRAINEESHIP AUGMENTATION FOR AEROSOL OPTICAL PROPERTIES STUDY Annual Report, 1 Aug. 1992 - 31 Jul. 1993
James M. Rosen 31 Jul. 1993 3 p
(Contract F49620-92-J-0427)
(AD-A278466; AFOSR-94-0214TR) Avail: CASI HC A01/MF A01

The purpose of this research is to develop a diverse family of optical devices for measuring optical properties of the free troposphere and obtain data sets study these properties. Efforts to design and construct several components of an aerosol calibration system were completed. A series of preliminary field measurements using these new components was completed and the results were favorable. The effort of work under this EPSCOR grant has had a significant impact on the parent grant. DTIC

N94-33676 Aerospace Corp., El Segundo, CA. Technology Operations.
INSTRUMENTATION ON THE RAIDS EXPERIMENT 2: EXTREME ULTRAVIOLET SPECTROMETER, PHOTOMETER, AND NEAR IR SPECTROMETER
A. B. Christensen, D. C. Kayser, J. B. Pranke, Supriya Chakrabarti, and R. P. McCoy 20 Feb. 1994 17 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F04701-88-C-0089)
(AD-A278543; TR-92(2940)-8; SMC-TR-94-18) Avail: CASI HC A03

The RAIDS experiment consists of eight instruments spanning the wavelength range from the extreme ultraviolet (55 nm) to the near infrared (800 nm) oriented to view the Earth's limb from the NOAA-J spacecraft to be launched into a circular orbit in 1993. Through measurements of the natural optical emissions and scattered sunlight originating in the upper atmosphere including the mesosphere and thermosphere, state variables such as temperature, composition, density and ion concentration of this region will be inferred. This report describes the subset of instruments fabricated or otherwise provided by the Space and Environment Technology Center (formerly Space Sciences Laboratory) at The Aerospace Corp. The companion to this report describes the instruments from the Naval Research Laboratory. The Extreme Ultraviolet Spectrograph (EUVS), the three fixed filter photometers OI (630), OI (777), and Na (589), and the near infrared spectrometer (NIR) will be described. These are all mounted on a mechanical scan platform that scans the limb from approximately 75 to 750 km in the orbital plane of the satellite every 90 seconds. DTIC

N94-33677 Colorado State Univ., Fort Collins, CO. Dept. of Electrical Engineering.

MULTIPARAMETER RADAR AND AIRCRAFT BASED STUDIES OF MICROPHYSICAL, KINEMATIC, AND ELECTRICAL STRUCTURE OF CONVECTIVE CLOUDS DURING CaPE Final Report, 15 Jan. 1991 - 14 Jan. 1994

V. N. Bringi 31 Mar. 1994 37 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Grant AF-AFOSR-0141-91)

(AD-A278544; AFOSR-94-0246TR) Avail: CASI HC A03

Two storms from the 9 August, 1991 CaPE case were analyzed in-depth focusing on multiparameter radar signature evolution over 60 min. in coordination with 24 aircraft penetrations which provided particle image and electric field data together with vertical air motion, cloud water and other state parameters. A total of five discrete 'cells' were identified in the two storms and their life cycle fully documented. Collaboration with South Dakota School of Mines and University of Alabama at Huntsville has resulted in a full integration of aircraft image and field mill data (from SDSM&T T-28 aircraft) with vertical air motion from dual-Doppler wind synthesis (UAH). The cellular evolution starts with a warm rain phase where updrafts and a very low concentration of large drops dominate the cloud. As the supercooled drops rise in the updraft they freeze and acquire a water-coat possibly by collisions with other liquid drops. The multi-parameter radar signatures clearly identify this mixed-phase zone. The cloud thereafter gets electrified which may intensify to produce lightning depending on cloud vertical growth, and generation of updraft/ downdrafts. DTIC

N94-33729# URS/Blume (John A.) and Associates, San Francisco, CA.

PROCESSED SEISMIC MOTION RECORDS FROM EARTHQUAKES, 1982-1993: RECORDED AT SCOTTY'S CASTLE, CALIFORNIA

P. K. Lum and K. K. Honda Oct. 1993 311 p

(Contract DE-AC08-89NV-10733)

(DE94-001371; JAB-10733-TM12) Avail: CASI HC A14/MF A03

As part of the contract with the US Department of Energy, Nevada Operations Office (DOE/NV), URS/John A. Blume & Associates, Engineers (URS/Blume) maintained a network of seismographs to monitor the ground motion generated by the underground nuclear explosions (UNE's) at the Nevada Test Site (NTS). The seismographs were located in the communities surrounding the NTS and the Las Vegas valley. When these seismographs were not used for monitoring the UNE generated motions, a limited number of seismographs were maintained for monitoring motion generated by other than UNE's (e.g. motion generated by earthquakes, wind, blast). Scotty's Castle was one of the selected earthquake monitoring stations. During the period from 1982 through 1993, numerous earthquakes which varied in magnitudes and distances were recorded at Scotty's Castle. The records from 24 earthquakes were processed and included in this report. The processed earthquakes are listed in chronological order and in the order of epicentral distances, respectively. These epicenters and magnitudes are shown. Due to the potential benefit of these data for the scientific community, DOE/NV and the National Park Service authorize the release of these records. DOE

N94-33731# Department of Energy, Washington, DC. Environmental Sciences Div.

ATMOSPHERIC SCIENCES PROGRAM SUMMARIES OF RESEARCH IN FY 1993

Nov. 1993 51 p

(DE94-003486; DOE/ER-0596T(11-93)) Avail: CASI HC A04/MF A01

This document describes the activities and products of the Atmospheric Science Program of the Environmental Sciences Division, Office of Health and Environmental Research, Office of Energy Research, in FY 1993. Each description contains the project's title; three-year funding history; the contract period over which the funding applies; the name(s) of the principal investigator(s); the institution(s) conducting the projects; and the project's objectives, products, approach, and results to date. Project descriptions are categorized within the report according to program areas: atmospheric chemistry, atmospheric dynamics, and support operations. Within these categories, the descriptions are ordered alphabetically by principal investigator. Each program area is preceded by a brief text that defines the program area, states its goals and objectives, lists principal research questions, and identifies program managers. Appendixes provide the addresses and telephone numbers of the principal investigators and define the acronyms used. This document has been indexed to aid the reader in locating research topics, participants, and research institutions in the text and the project descriptions. Comprehensive subject, principal investigator, and institution indexes are provided at the end of the text for this purpose. The comprehensive subject index includes keywords from the introduction and chapter texts in addition to those from the project descriptions. DOE

N94-33850 Aerospace Corp., El Segundo, CA. Engineering and Technology Group.

SUBSTORM AURORAE AND THEIR CONNECTION TO THE INNER MAGNETOSPHERE

R. E. Lopez, C. I. Meng, and H. E. Spence 15 Apr. 1994 15 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F04701-93-C-0094)

(AD-A277609; TR-94(4940)-2; SMC-TR-94-10) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

In this report we present evidence from the low-altitude DMSP F7 satellite that the poleward edge of auroral luminosity in the nightside auroral zone does not necessarily correspond to the boundary between plasma-filled flux tubes and flux tubes devoid of plasma. Assuming that the low-altitude boundary corresponds to the boundary between the lobe and the plasma sheet, this implies that the boundary between open and closed field lines may lie poleward of the most poleward auroral luminosity. Thus the assumption that the poleward boundary of auroral luminosity is a good indicator of the open-closed boundary may not always be correct. Furthermore, we show clear evidence that an auroral surge may also be located equatorward of the open-closed boundary. Therefore, tailward of the region of the plasma sheet to which the surge is connected there may exist undisturbed plasma sheet that has not yet been disconnected from the ionosphere. This means that substorm-associated reconnection does not necessarily begin to reconnect lobe field lines at the onset of a substorm. Moreover, available evidence strongly suggests that the arc that brightens at the onset of a substorm and that develops into a surge maps to the inner magnetotail, to that region at the inner edge of the plasma sheet where the magnetic field changes from a dipolar to a tail-like configuration. This would be consistent with recent studies that connect auroral breakup to the near-Earth plasma sheet. DTIC

N94-33851 Aerospace Corp., El Segundo, CA. Engineering and Technology Group.

CDAW-9 ANALYSIS OF MAGNETOSPHERIC EVENTS ON 3 MAY 1986: EVENT C

D. N. Baker, T. I. Pulkkinen, R. L. McPherron, J. D. Craven, and L. A. Frank 1 Oct. 1993 64 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F04701-88-C-0089)

(AD-A277610; TR-93(3940)-9; SMC-TR-94-03) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The ninth Coordinated Data Analysis Workshop (CDAW-9) focussed upon several intervals within the PROMIS period (March-June 1986). Event interval C comprised the period 0000-1200 UT on 3 May 1986 which was a highly disturbed time near the end of a geomagnetic storm interval. A very large substorm early in the period commenced at 0111 UT and had a peak AE index value of approximately 1500 nT. Subsequent activity was lower, but at least three other substorms occurred at 2-3 hour intervals. The substorms on 3 May were well observed by a variety of satellites, including ISEE-1, -2, and IMP-8 in the magnetotail plus SCATHA, GOES, GMS, and LANL spacecraft at or near geostationary orbit. A particularly important feature of the 0111 UT substorm was the simultaneous imaging of the southern auroral oval by DE-1 and of the northern oval by Viking. The excellent constellation of spacecraft near local midnight in the radial range 5-9 RE made it possible to study the strong cross-tail current development during the substorm growth phase and the current disruption and current wedge development during the expansion phase. We use a time-evolving magnetic field model to mad observed auroral features out into the magnetospheric equatorial plane. There was both a dominant eastward and a weaker westward progression of activity following the expansion phase. A clear latitudinal separation of the initial region of auroral brightening and the region of intense westward electrojet current was identified. DTIC

N94-33910# Los Alamos National Lab., NM.
DIFFUSION AT THE MAGNETOPAUSE: A THEORETICAL PERSPECTIVE
D. Winske, V. A. Thomas, and N. Omidi 1994 16 p Presented at the Chapman Conference on Physics of the Magnetopause, San Diego, CA, 14-18 Mar. 1994
(Contract W-7405-eng-36)
(DE94-009356; LA-UR-94-916; CONF-940393-2) Avail: CASI HC A03/MF A01

This paper discusses theoretical aspects of cross-field wave-particle transport at the magnetopause. The basic framework for calculating the transport based on second order theory is reviewed. Instabilities that give rise to the waves which then lead to particle scattering and diffusion are discussed, and in particular, the lower hybrid drift instability is emphasized. The linear and nonlinear properties of this instability are presented, along with results from relevant computer simulations. Other potential diffusion processes at the magnetopause are also described. The overall conclusion, supported by wave and particle observations, is that wave-particle diffusion is a relatively weak process at the magnetopause. Further, it is argued that this line of research, while illuminating potential new mechanisms, cannot address the more important question of diffusion and transport on a spatial scale of many ion gyroradii over a temporal scale of many ion gyroperiods. A new paradigm to examine the global aspects of magnetopause transport on ion scales using hybrid code methods is presented. Results of two dimensional hybrid simulations show that the structure of the magnetopause for northward interplanetary magnetic field is reproduced, and the resulting transport in this case is due to waves below the ion gyrofrequency. Diffusion in the presence of viscous transport due to the kinetic Kelvin-Helmholtz instability is then discussed. The potential for the study of particle diffusion, viscous interactions, and magnetic reconnection simultaneously through this paradigm is also addressed. DOE

N94-33931# Lawrence Livermore National Lab., CA.
SEISMIC EVENT INTERPRETATION USING FUZZY LOGIC AND NEURAL NETWORKS
W. J. Maurer and F. U. Dowla Jan. 1994 24 p
(Contract W-7405-eng-48)
(DE94-009469; UCRL-ID-116130) Avail: CASI HC A03/MF A01

In the computer interpretation of seismic data, unknown sources of seismic events must be represented and reasoned about using measurements from the recorded signal. In this report, we develop the use of fuzzy logic to improve our ability to interpret weak seismic events. Processing strategies for the use of fuzzy set theory to represent vagueness and uncertainty, a phenomena common in seismic data analysis, are developed. A fuzzy-assumption based truth-maintenance-inferencing engine is also developed. Preliminary results in interpreting seismic events using the fuzzy neural network knowledge-based system are presented. DOE

N94-33992*# National Academy of Sciences - National Research Council, Washington, DC. Commission on Geosciences, Environment, and Resources.
MOUNT RAINIER ACTIVE CASCADE VOLCANO
1994 128 p Sponsored in part by DOE, NSF and Geological Survey
(Grant NAGw-3516)
(NASA-CR-195893; NAS 1.26:195893; LC-94-66300; ISBN-0-309-05083-9)
Copyright Avail: CASI HC A07/MF A02

Mount Rainier is one of about two dozen active or recently active volcanoes in the Cascade Range, an arc of volcanoes in the northwestern United States and Canada. The volcano is located about 35 kilometers southeast of the Seattle-Tacoma metropolitan area, which has a population of more than 2.5 million. This metropolitan area is the high technology industrial center of the Pacific Northwest and one of the commercial aircraft manufacturing centers of the United States. The rivers draining the volcano empty into Puget Sound, which has two major shipping ports, and into the Columbia River, a major shipping lane and home to approximately a million people in southwestern Washington and northwestern Oregon. Mount Rainier is an active volcano. It last erupted approximately 150 years ago, and numerous large floods and debris flows have been generated on its slopes during this century. More than 100,000 people live on the extensive mudflow deposits that have filled the rivers and valleys draining the volcano during the past 10,000 years. A major volcanic eruption or debris flow could kill thousands of residents and cripple the economy of the Pacific Northwest. Despite the potential for such danger, Mount Rainier has received little study. Most of the geologic work on Mount Rainier was done more than two decades ago. Fundamental topics such as the development, history, and stability of the volcano are poorly understood. Derived from text

N94-34132# Lawrence Livermore National Lab., CA.
RESOLUTION OF ITERATIVE INVERSES IN SEISMIC TOMOGRAPHY
J. G. Berryman Feb. 1994 3 p Presented at the Lanczos Centenary Conference, Raleigh, NC, 12-17 Dec. 1993
(Contract W-7405-eng-48)
(DE94-008079; UCRL-JC-116371; CONF-931260-1) Avail: CASI HC A01/MF A01

With applications to seismic travel time tomography in mind, methods have been developed for computing both the model and data resolution matrices for iterative inverse such as those produced by the Lanczos scheme for finding a matrix inverse. DOE

N94-34227# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY OF GRAVITY WAVE IN THE UPPER ATMOSPHERE BY WAY OF OH* (9-4) AND O2(B 1 SIGMA(+,G), 0-1) BANDS NIGHTGLOW OBSERVATIONS [ESTUDO DE ONDAS DE GRAVIDADE NA ALTA ATMOSFERA ATRAVES DE OBSERVACOES DE LUMINESCENCIA ATMOSFERICA DA HIDROXILA OH (9-4) E OXIGENIO O2(0-1)]
Delano Gobbi May 1993 227 p In PORTUGESE
(INPE-5539-TDI/527) Avail: CASI HC A11/MF A03

The effects of gravity waves on the O2(b 1 Sigma(+,g), 0-1) and OH* (9-4) nightglow emissions in the mesopause region (between 80 to 100 km) are examined. The study consists of two parts: spectral analysis of the quasiperiodic fluctuations in the intensities (apparent emission rate) and rotational temperatures, collected by MULTI2 experiment, and theoretical interpretation of the results from the data, on the basis of photochemical-dynamic atmospheric model with the inclusion of dissipation. Wave-like events in the band emission intensities and temperatures are assumed to be a consequence of changes of airglow layer by gravity waves. The Krassovsky's ratio eta, quantitative relation of the fractional fluctuations in the emission rate and temperature, is the parameter used to compare model calculations and observed values. In reference to O2(b 1 Sigma(+,g), 0-1) emission, a total of twelve wave-like events were found, with apparent periods of 42 and 142 minutes. The observed amplitudes eta(sub O2(b)) showed an increased trend on the long wave periods, in accordance with the predicted calculations. The fluctuations of the temperature and the emission rate were mostly in phase, which is expected from model predictions. Regarding the OH* (9-4) emission, eight wave-like events were found, with apparent periods of 41 and 196 minutes. The observed eta(sub OH*) are in agreement with the model calculations, mainly for long wave periods. This study demonstrated that measurements of eta must be made in conjunction with observations of horizontal structure of wave, in addition to the background wind (Doppler shift) in that region. Author (revised)

N94-34228# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ITERATIVE REGRESSION ANALYSIS OF PERIODICITIES IN Be-10 AND C-14 ATMOSPHERIC COSMONUCLIDES VARIATIONS M.S. Thesis [ANALISE POR REGRESSAO ITERATIVA DE PERIODICIDADES NAS VARIACOES DOS COSMONUCLIDEOS ATMOSFERICOS BE-10 E C-14]
Nivaor Rodolfo Rigozo Mar. 1994 89 p In PORTUGESE
(INPE-5547-TDI/533) Avail: CASI HC A05/MF A01

The aim of this work was to use an iterative regression analysis for the determination of geophysical time series periodicities. This method gives the standard deviation associated to the three parameters determined for each periodicity. This feature allows the selection of the amplitudes with higher amplitude/deviation ratio. The method used was compared with the periodogram method, Fourier analysis, and maximum entropy spectral analysis. It was then applied to the analysis of the main periodicities in time series of atmospheric cosmonuclides (atmospheric carbon-14 and beryllium-10 of ice cores from Greenland and Antarctica), mean surface temperatures, and indicators of atmospheric volcanic dust. During the time interval of these series, the periodicities found were compared from the point of view of possible causal associations between the phenomenon

such as solar activity, cosmonuclides in the terrestrial atmosphere, atmospheric circulation, temperatures of the atmosphere, and volcanic dust in the atmosphere. Author (revised)

N94-34600 National Oceanic and Atmospheric Administration, Boulder, CO. Space Environment Lab.
UTILITY OF INTERPLANETARY SCINTILLATION MAPS IN FORECASTING GEOMAGNETIC ACTIVITY: A STUDY BASED ON SINGLE-STATION DATA FROM CAMBRIDGE, UNITED KINGDOM
H. Leinbach, S. Ananthakrishnan, and T. R. Detman Mar. 1994 34 p See also AD-A161621 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB94-156775; NOAA-TM-ERL-SEL-83) Avail: CASI HC A03

The Space Environment Laboratory, using interplanetary scintillation (IPS) data from the Mullard Radio Astronomy Observatory, Cambridge, UK, has investigated Hewish's suggestion that all-sky g-maps of the relative scintillation of radio sources can be used to forecast geomagnetic storms. On the basis of our analysis of more than 2 years of maps, we conclude that the single-station observations do not meet the criteria for a viable forecasting tool. The reasons are threefold: (1) the problems inherent in detecting and analyzing IPS events on maps that take 24 hours to complete; (2) serious questions about the quality of the IPS g-values; and (3) difficulties in interpreting two-dimensional IPS events as three-dimensional solar wind disturbances. These issues are discussed in detail, and recommendations are made for future work to demonstrate that IPS observations can be used for real-time forecasting. NTIS

N94-34669*# Alabama Univ., Huntsville, AL. Dept. of Electrical and Computer Engineering.
STUDIES ON EQUATORIAL SHOCK FORMATION DURING PLASMASPHERIC REFILLING Annual Progress Report No. 3, 1993 - 1994
N. Singh May 1994 96 p
(Grant NAGw-2128)
(NASA-CR-195864; NAS 1.26:195864; UAH-94-430) Avail: CASI HC A05/MF A01

Investigations based on small-scale simulations of microprocesses occurring when a magnetic flux tube refills with a cold plasma are summarized. Results of these investigations are reported in the following attached papers: (1) 'Numerical Simulation of Filling a Magnetic Flux Tube with a Cold Plasma: The Role of Ion Beam-Driven Instabilities'; and (2) 'Numerical Simulation of Filling a Magnetic Flux Tube with a Cold Plasma: Effects of Magnetically Trapped Hot Plasma'. Other papers included are: 'Interaction of Field-Aligned Cold Plasma Flows with an Equatorially-Trapped Hot Plasma: Electrostatic Shock Formation'; and 'Comparison of Hydrodynamic and Semikinetic Treatments for a Plasma Flow along Closed Field Lines'. A proposal for further research is included. CASI

N94-34950 Iowa Univ., Iowa City, IA.
LANDAU DAMPING OF AURORAL HISS Ph.D. Thesis
David DeWitt Morgan 1992 129 p
Avail: Univ. Microfilms Order No. DA9318475

Auroral hiss is observed to propagate over distances comparable to an earth radius from its source in the auroral zone. In this paper the role of Landau damping is investigated for upward propagating distribution function. The effect of Landau damping is calculated as the wave propagates through the environment around the auroral zone. Is is found that Landau damping puts a lower limit on the wavelength of auroral hiss. Poleward of the auroral zone, the particle energy is found in a typical case to limit the resonance energy to a value of approximately 3.2 keV or greater and to limit the wavelength to a value of about 2 km or greater. For equatorward propagation, the resonance energy must be greater than 10 keV and the wavelength must be greater than 3 km to avoid unacceptably large damping. Landau damping is found to be a likely mechanism for explaining some of the one-sided auroral hiss funnels observed by Dynamics Explorer 1, although we cannot account in detail for cases showing equatorward propagation. Upgoing electron beams of energy high enough to generate auroral hiss of the inferred wavelengths are not usually observed. Partial transmission involving interfaces oblique to the magnetic field is considered as a possible wavelength conversion mechanism. Dissert. Abstr.

N94-34992*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
HIGH DEGREE GRAVITATIONAL SENSITIVITY FROM MARS ORBITERS FOR THE GMM-1 GRAVITY MODEL
F. J. Lerch, D. E. Smith, J. C. Chan, G. B. Patel, and D. S. Chinn May 1994 20 p
(RTOP 926-00-00)
(NASA-TM-104604; Rept-94B00083; NAS 1.15:104604) Avail: CASI HC A03/MF A01

Orbital sensitivity of the gravity field for high degree terms (greater than 30) is analyzed on satellites employed in a Goddard Mars Model GMM-1, complete in spherical harmonics through degree and order 50. The model is obtained from S-band Doppler data on Mariner 9 (M9), Viking Orbiter 1 (VO1), and Viking Orbiter 2 (VO2) spacecraft, which were tracked by the NASA Deep Space Network on seven different highly eccentric orbits. The main sensitivity of the high degree terms is obtained from the VO1 and VO2 low orbits (300 km periapsis altitude), where significant spectral sensitivity is seen for all degrees out through degree 50. The velocity perturbations show a dominant effect at periapsis and significant effects out beyond the semi-latus rectum covering over 180 degrees of the orbital groundtrack for the low altitude orbits. Because of the wideband of periapsis motion covering nearly 180 degrees in w and +39 degrees in latitude coverage, the VO1 300 km periapsis altitude orbit with inclination of 39 degrees gave the dominant sensitivity in the GMM-1 solution for the high degree terms. Although the VO2 low periapsis orbit has a smaller band of periapsis mapping coverage, it strongly complements the VO1 orbit sensitivity for the GMM-1 solution with Doppler tracking coverage over a different inclination of 80 degrees. Author (revised)

N94-33457*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
STRATOSPHERIC MODELS AND MEASUREMENTS: A CRITICAL COMPARISON
Ellis E. Remsberg *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 461-463 (For primary document see N94-33447 10-02)
Avail: CASI HC A01/MF A04

N94-33459*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
MODEL CAPABILITIES, 2-D
Charles H. Jackman *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 473-475 (For primary document see N94-33447 10-02)
Avail: CASI HC A01/MF A04

N94-33461*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
HIGH RESOLUTION INFRARED DATASETS USEFUL FOR VALIDATING STRATOSPHERIC MODELS
Curtis P. Rinsland *In its* First Annual High-Speed Research Workshop, Part 1 Apr. 1992 p 499-504 (For primary document see N94-33447 10-02)
Avail: CASI HC A02/MF A04

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N94-33359 California Univ., Los Angeles, CA.
US STREAMFLOW PATTERNS ASSOCIATED WITH THE EXTREME PHASES OF THE SOUTHERN OSCILLATION Ph.D. Thesis
Ercan Kahya 1993 158 p
Avail: Univ. Microfilms Order No. DA9318715

The potential for long-term stream flow forecasts based on atmospheric circulation indices in the United States has been assessed. The extreme phases of the southern oscillation (SO) have been linked to fairly persistent classes of atmospheric anomalies (e.g., precipitation) over the low and middle latitudes at regional and global sale. This study examines the relationships between the extreme phases of the SO and unimpaired stream discharges over the contiguous U.S. Of particular interest in this investigation

is the identification of areas of land that appear to have consistent and strong El Nino/southern oscillation (ENSO)-related stream flow signals. The first harmonic extracted from a 24-month ENSO composite at each station is assumed to be the ENSO-related signal appearing stream flow anomalies. The vectorial display of these harmonics over a map of the U.S. provides the areal extents of ENSO influence on stream flows. Similar analysis is performed for the La Nina phase of the SO. Strong and consistent stream flow responses to hypothesized ENSO forcing are found during a detected season in the four core areas: Gulf of Mexico, northeast, north central, and pacific northwest. The southwest is found to be another key region for the type 1 ENSO events. For the La Nina phase, each of these regions exhibit an equally reliable signal and almost same timing with that of ENSO signal. The appearance of both ENSO and La Nina signals is analyzed in conjunction with the annual cycle. Almost reversal in sign of streamflow anomalies occurred during ENSO events compared to these during La Nina events. The significance of relationships between the extremes of the SO and stream flows within each core area are determined by the hypergeometric distribution. A proper season that the SO index can be averaged to obtain a higher correlation value is found for each core area. Moreover some clues are presented so that ENSO events influence significantly the persistence in streamflow. Finally, individual streamflow records in the PNW and the SW demonstrate a significant difference in the means of a signal period (for either ENSO or La Nina) between the years that both SO extreme events occurred. Dissert. Abstr.

N94-33404 Coastal Engineering Research Center, Vicksburg, MS.
STORM EVOLUTION OF DIRECTIONAL SEAS IN SHALLOW WATER Final Report
Charles E. Long Feb. 1994 133 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278541; CERC-94-2) Avail: CASI HC A07

Measured storm wave frequency-direction spectra are presented to illustrate the evolution of wind wave energy distributions near times of high energy. Twenty-nine storm events, extracted from a 5-year database, are identified and described. The instrumentation consists of a nine-element linear array of bottom-mounted pressure gauges distributed along the 8-m isobath about 900 m offshore of Duck, NC, site of the Field Research Facility (FRF) of the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center. Iterative Maximum Likelihood Estimation is used to determine directional distributions of wave energy. Events, identified by elevation and duration of wave energy, are due to both localized storms and long-period swells radiating from major weather events in the distant, deep Atlantic Ocean. Frequency-direction spectra associated with storms known as northeasters have a curiously recurrent pattern of broad directional distributions at low frequencies near the spectral peaks and distinct bimodal distributions over a broad range of high frequencies. Reasons for this behavior are not obvious but require clarification because such wave patterns do not conform to conventional models used in engineering design. The differences may lead to substantial variations in design results. DTIC

N94-33550* National Aeronautics and Space Administration. John C. Stennis Space Center, Bay Saint Louis, MS.
HURRICANE ANDREW MISSION (Videotape)
21 Sep. 1992 Videotape: 5 min. 30 sec. playing time, in color, with sound
(NASA-TM-109797; NONP-VT-94-12925) Avail: CASI VHS A01/BETA A22

This video explains how NASA used their information on space development technology to assist in hurricane relief efforts. CASI

N94-33709 Washington Univ., Seattle, WA.
A NUMERICAL STUDY OF THUNDERSTORM ELECTRIFICATION Final Report, 11 Nov. 1990 - 30 Nov. 1993
Marcia B. Baker 4 Jan. 1994 3 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0012-91)
(AD-A277531; AFOSR-94-0066TR) Avail: CASI HC A01

The purpose of this research was to pursue further understanding of cloud electrification through three separate projects. First, radar observational data of New Mexico thunderstorm activity combined with a numerical thunderstorm model suggests that the degree of thunderstorm electrification depends on the time during which strong updrafts remain within the charging zone. Second, a simple numerical lightning model representing streamer propagation on a 2-D grid was developed. Realistic streamer paths evolve in the model and the conditions for IC and CG strokes are directly related to updraft velocity. Third, a simple cloud model was utilized to investigate factors influencing lightning frequency and its relationship to precipitation. Lightning and lightning frequency are shown to heavily depend on the depth of the charging region which is sensitive to vertical velocity. DTIC

N94-33728# Los Alamos National Lab., NM.
SENSITIVITY OF CLOUD FORCING TO THE CLOUD COVER PARAMETERIZATION IN A GCM
J. E. Kristjansson, L. H. Auer, and M. J. Newman 1993 3 p Presented at the 74th American Meteorological Society Annual Meeting, Nashville, TN, 23-28 Jan. 1994
(Contract W-7405-eng-36)
(DE94-000678; LA-UR-93-3483; CONF-940115-2) Avail: CASI HC A01/MF A01

As shown by Cess et al. (1990) uncertainties in how to treat clouds represent the largest source of uncertainty in today's climate models (GCM's). Using the Los Alamos GCM (LAGCM), we have studied one component of this 'puzzle', namely the prediction of the fraction of a grid box that contains stratiform clouds, and investigated the sensitivity of a GCM to this quantity. Comparisons have been made of how these schemes affect both solar (SW) and terrestrial (LW) radiation. Further more, 1-year simulations with the three schemes reveal how the model's climate evolves differently in the three cases. No turning of the model to the different schemes is attempted, as we want the interpretation of the results to be as unambiguous as possible. The LAGCM has 20 vertical levels and a horizontal resolution corresponding to R15 truncation. The radiation scheme has prescribed cloud albedos, depending on cloud height, and unit emissivity everywhere. DOE

N94-33752*# North Carolina State Univ., Raleigh, NC. Dept. of Marine, Earth, and Atmospheric Sciences.
MESO-BETA SCALE NUMERICAL SIMULATION STUDIES OF TERRAIN-INDUCED JET STREAK MASS AND MOMENTUM PERTURBATIONS Semiannual Report, FY 1994
Yuh-Lang Lin and Michael L. Kaplan May 1994 26 p
(Grant NAG5-1790)
(NASA-CR-195863; NAS 1.26:195863) Avail: CASI HC A03/MF A01

An in-depth analysis of observed gravity waves and their relationship to precipitation bands over the Montana mesonetwork during the 11-12 July 1981 CCOPE case study indicated two episodes of coherent waves. While geostrophic adjustment, shearing instability, and terrain were all implicated separately or in combination as possible wave generation mechanisms, the lack of upper-air data within the wave genesis region made it difficult to define the genesis processes from observations alone. The first part of this paper, 3D Numerical Modeling Studies of Terrain-Induced Mass/Momentum Perturbations, employs a mesoscale numerical model to help diagnose the intricate early wave generation mechanisms during the first observed gravity wave episode. The meso-beta scale numerical model is used to study various simulations of the role of multiple geostrophic adjustment processes in focusing a region for gravity wave genesis. The second part of this paper, Linear Theory and Theoretical Modeling, investigates the response of non-resting rotating homogeneous and continuously stratified Boussinesq models of the terrestrial atmosphere to temporally impulsive and uniformly propagating three-dimensional localized zonal momentum sources representative of midlatitude jet streaks. The methods of linear perturbation theory applied to the potential vorticity (PV) and wave field equations are used to study the geostrophic adjustment dynamics. The total zonal and meridional wind perturbations are separated into geostrophic and ageostrophic components in order to define and follow the evolution of both the primary and secondary mesocirculations accompanying midlatitude jetogenesis forced by geostrophic adjustment processes. This problem is addressed to help fill the gap in understanding the dynamics and structure of mesoscale inertia-gravity waves forced by geostrophic adjustment processes in simple two-dimensional quiescent current systems and those produced by mesoscale numerical models simulating the orographic and diabatic perturbation of three-dimensional quasi-geostrophically balanced synoptic scale jet streaks associated with

complex baroclinic severe storm producing environments.

Derived from text

N94-33769 Wisconsin Univ., Madison, WI. Space Science and Engineering Center.

TYPHOON MONITORING USING PASSIVE SATELLITE OBSERVATIONS Final Report

Christopher Velden and Robert Merrill Feb. 1994 56 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-88-K-0711)

(AD-A277859) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

During the 5 1/2 years that this contract was active, the scientific goals evolved to include three main areas of research: (1) Typhoon monitoring using passive microwave observations; (2) the ONR tropical cyclone motion initiative; and (3) participation in the tropical cyclone motion field experiment (TCM-90). Accomplishments and scientific results from each of these topics are summarized. DTIC

N94-33859 Sparta, Inc., Lexington, MA.

A STUDY OF THE IMPACT OF CIRRUS CLOUDS ON HIGH ALTITUDE, LONG HORIZONTAL PATH LASER TRANSMISSION

G. G. Koenig, D. R. Longtin, and J. R. Hummel 23 Dec. 1993 38 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F19628-91-C-0093)

(AD-A278563; LTR93-016; PL-TR-93-2263; AD-E201852; SR-7) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The Geophysics Directorate of the USAF Phillips Laboratory is supporting efforts to estimate the environmental impacts on the proposed AirBorne Laser (ABL) system, a laser system being considered for theater missile defense. One of the environmental factors of particular concern is cirrus clouds which can be found at the proposed levels for the ABL system. Cirrus clouds can have spatial extents ranging from several tens of meters to several thousands of kilometers and are found at altitudes ranging from 4.0 to 20.0 kilometers. They are very persistent, and have a wide range of optical properties. Even cirrus clouds that have very low extinction coefficients, thus rendering them not visible for most viewing geometries, can have an effect on an Electro-Optic (EO) system if the cirrus optical path of the EO system is fairly long. Cirrus clouds with low extinction coefficients are difficult to remotely sense with either ground or space based systems. Therefore, many of the present cirrus cloud databases contain incomplete information about optically thin cirrus clouds. The problem of determining cirrus cloud physical and optical properties is compounded by the high altitude location of these clouds. Recently, a number of programs have been conducted to investigate the physical and optical properties of cirrus clouds because of their unique impact on the global climate. These databases provide information that can be applied to studies of the impacts of cirrus on EO systems operating at cirrus cloud altitude and above.

DTIC

N94-34135*# North Dakota Univ., Grand Forks, ND. Dept. of Atmospheric Sciences.

UNIVERSITY OF NORTH DAKOTA CITATION FIRE CIRRUS 2 MISSION SUMMARY AND DATA REPORT

Michael R. Poellot and Brian Henderson 15 Mar. 1994 207 p

(Grant NAG1-1351)

(NASA-CR-195842; NAS 1.26:195842) Avail: CASI HC A10/MF A03

The following document represents a summary overview of the data collected by the University of North Dakota Citation research aircraft during the First ISCCP Regional Experiment (FIRE) Cirrus IFO-2. The purpose of this report is to provide a quick-look summary of select parameters to FIRE investigators to assist in the use of this data set. The full data set resides in the FIRE archive. The data presented in this report should be considered preliminary and should not be used for reproduction.

Derived from text

N94-34202# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THEORETIC STUDY OF GREEN'S MODES M.S. Thesis [ESTUDO TEORICO DOS MODOS DE GREEN]

Jose Antonio Aravequia May 1993 90 p In PORTUGESE

(INPE-5536-TDI/524) Avail: CASI HC A05/MF A01

The effects of latent heat liberation on baroclinic instability processes is studied using the model developed by Bonatti and Rao. This model includes the effect of latent heat liberation as parametrized by Mak using a linear zonal wind profile and a constant lapse rate of -6 K/km. The effect of dissipative terms and variation of vertical heating on baroclinic instability is studied. Dissipative terms and the type and intensity of heating changes the selection of the most unstable mode. Viscosity and Newtonian cooling stabilize short wave modes while the cumulus friction destabilizes waves of around 1000 km wavelengths. Using double maximum in the vertical distribution of heating and observed vertical profile of zonal wind and temperature representative of summer monsoon region of India, the most unstable wavelength and its vertical structure resemble the observed characteristics of monsoon depression. The inclusion of heating is essential to obtain characteristics of the most unstable wave similar of the observed scale. The inclusion of the friction and Newtonian cooling sometimes gives the most unstable wave as Green's modes. The vertical distribution of energy conversion terms showed that Charnley modes are confined to the lower levels while Green's modes are more extended in the vertical.

Author

N94-34408# National Weather Service, Fort Worth, TX.

IMPACT OF WEATHER ON FLIGHT OPERATIONS AT A MAJOR AIRPORT

J. R. Ott and J. W. Ladd Mar. 1994 18 p See also NTISUB-D-104003

(PB94-127990; NOAA-TM-NWS-SR-154) Avail: CASI HC A03/MF A01

Following the crash of a Southern Airways jet at New Hope, Georgia, on April 4, 1977, the Federal Aviation Administration (FAA) recognized the need of timely dissemination of hazardous weather conditions to flight crews (National Transportation Safety Board, 1977). The establishment of the Center Weather Service Unit (CWSU) in each of the Air Route Traffic Control Centers (ARTCC) resulted. The Dallas/Fort Worth International Airport (DFW) is a major complex -- rated the second busiest in the world behind Chicago O'Hare International Airport (ORD). The paper will examine the impact that adverse weather conditions, especially those that may not be accurately forecast, can have on DFW operations. Emphasis will be placed on the importance of coordination between the CWSU and ARTCC personnel, and also between the CWSU and the Weather Service Forecast Office (WSFO). NTIS

N94-34910 California Univ., Los Angeles, CA.

EFFECTS OF MESOSCALE CONVECTIVE ORGANIZATION AND VERTICAL WIND SHEAR ON THE CUMULUS-ENVIRONMENT INTERACTION Ph.D. Thesis

Xiaoqing Wu 1992 246 p

Avail: Univ. Microfilms Order No. DA9317415

This study is made to understand the thermodynamic and dynamic aspects of cumulus-environment interaction. Specifically, we examine (1) the similarities and differences of cumulus-environment interactions in the tropical and midlatitude convective systems, (2) the impact of the presence of mesoscale circulations on the interpretation of cumulus-environment interaction, and (3) the effects of vertical wind shear on the dynamic interaction of cumulus convection with the large-scale motion. Analyses of PRE-STORM and GATE data show larger moist convective instability, large-scale forcing and vertical wind shear in the midlatitude MCC's and squall lines than in the tropical non-squall clusters. It is found that the interaction mechanism based on the cumulus-induced subsidence and detrainment is capable of explaining most of the observed heating and drying under widely different environment conditions. The Arakawa-Schubert (A-S) 'quasi-equilibrium' assumption is valid and holds better in the midlatitude since the large-scale forcing is much stronger. Both the cumulus and stratiform cloud effects are stronger in midlatitude convective systems than in tropical systems. The heat and moisture budget results using the fine resolution SESAME data show pronounced 'dipole' patterns in the horizontal distributions of vertically integrated heat source and moisture sink. Further analyses, using the 'large-scale' and 'mesoscale' data which are obtained by applying low-pass and band-pass spatial filters to the original SESAME data, show that the dipole pattern is closely related to the horizontal

fluxes of heat and moisture due to mesoscale circulations. Tests of the A-S parameterization scheme with the 'mesoscale' and 'large-scale' data show that the quasi-equilibrium assumption becomes more accurate for the data resolving mesoscale circulations. The inclusion of down-drafts is required to accurately predict the cumulus heating and drying. We find the significant difference in vertical transports of horizontal momentum between MCC and squall line. The downgradient transport of momentum is dominant in the MCC. On the other hand, the vertical transport of momentum normal to the squall line is upgradient, while the transport of momentum parallel to the line is downgradient. A new cloud momentum model which includes the convective-scale horizontal pressure gradient force has been developed. The pressure gradient force is related to the vertical wind shear, convective mass flux and orientation or organized convection. The application of the new cloud momentum model to the MCC's and squall lines observed during SESAME and PRE-STORM shows that the new model can simulate both the upgradient and downgradient transports of cloud momentum.
Dissert. Abstr.

N94-34939*# Ensco, Inc., Melbourne, FL. Applied Meteorology Unit.
THE ANALYSIS OF RAPIDLY DEVELOPING FOG AT THE KENNEDY SPACE CENTER Final Report
Mark M. Wheeler, Michael K. Atchison, Robin Schumann, Greg E. Taylor, Ann Yersavich, and John D. Warburton May 1994 68 p Original contains color illustrations
(Contract NAS10-11844)
(NASA-CR-195888; Rept-94-002; NAS 1.26:195888) Avail: CASI HC A04/MF A01; 6 functional color pages

This report documents fog precursors and fog climatology at Kennedy Space Center (KSC) Florida from 1986 to 1990. The major emphasis of this report focuses on rapidly developing fog events that would affect the less than 7-statute mile visibility rule for End-Of-Mission (EOM) Shuttle landing at KSC (Rule 4-64(A)). The Applied Meteorology Unit's (AMU's) work is to: develop a data base for study of fog associated weather conditions relating to violations of this landing constraint; develop forecast techniques or rules-of-thumb to determine whether or not current conditions are likely to result in an acceptable condition at landing; validate the forecast techniques; and transition techniques to operational use. As part of the analysis the fog events were categorized as either advection, pre-frontal or radiation. As a result of these analyses, the AMU developed a fog climatological data base, identified fog precursors and developed forecaster tools and decision trees. The fog climatological analysis indicates that during the fog season (October to April) there is a higher risk for a visibility violation at KSC during the early morning hours (0700 to 1200 UTC), while 95 percent of all fog events have dissipated by 1600 UTC. A high number of fog events are characterized by a westerly component to the surface wind at KSC (92 percent) and 83 percent of the fog events had fog develop west of KSC first (up to 2 hours). The AMU developed fog decision trees and forecaster tools that would help the forecaster identify fog precursors up to 12 hours in advance. Using the decision trees as process tools ensures the important meteorological data are not overlooked in the forecast process. With these tools and a better understanding of fog formation in the local KSC area, the Shuttle weather support forecaster should be able to give the Launch and Flight Directors a better KSC fog forecast with more confidence. Author

48 OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing.*

N94-33413 Biotronics Technologies, Inc., Waukesha, WI.
ULTRAVIOLET ABSORPTION SPECTROMETRY (UVAS) AND LIQUID ATOMIC EMISSION SPECTROMETRY (LAES) FOR OCEANOGRAPHIC ANALYSIS SYSTEMS
Kenneth J. Schlager and Monica A. Wilson 10 Feb. 1994 91 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-92-C-6006; ONR Proj. R011805)
(AD-A278263; NRL-CR/7410-94-0010) Avail: CASI HC A05

The Ultraviolet Absorption Spectrometry (UVAS) and Liquid Atomic Emission Spectrometry (LAES) for Oceanographic Analysis Systems project was a four-phase project that covered over 20 months from 22 May 1992 to 10 Feb. 1994. Under contract with the Naval Research Laboratory at Stennis Space Center, Mississippi, Biotronics Technologies, Inc., worked to design, build, and test an on-line spectrophotometer capable of real-time, reagentless chemical analysis of ocean and bay waters. More specifically, the project had three objectives: (1) to determine spectral parameters of nutrients and selected metals, first in pure distilled water and then in ocean and bay water, and to use this information to predict analyte concentrations and determine design parameters for the deliverable instrument; (2) to design, construct, and test the hardware and software for the deliverable instrument; and (3) to test the instrument on board a Navy test vessel in actual field conditions and determine the accuracy of analyte concentration predictions. DTIC

N94-33435# Naval Command, Control and Ocean Surveillance Center, San Diego, CA.
OCEAN SURFACE ROUGHNESS FROM INFRARED MEASUREMENTS: A FAILURE OF SHAPE FROM REFLECTION Final Report
K. D. Anderson May 1993 36 p
(ONR Proj. R035E81)
(AD-A278008; NRAD-TR-1609) Avail: CASI HC A03/MF A01

The objective of this effort is to test the practicality of an instrument that uses the reflection coefficient modulated radiance (shape from reflection) to measure the roughness of the sea surface. Conceptually, this instrument would be used aboard ship to remotely sense the ocean wave spectrum of the sea surface; ideally, the ocean wave spectrum covered by this instrument would range from very long wavelengths, on the order of decameters, to very short wavelengths, on the order of centimeters. A series of wave tank measurements made at the Scripps Institution of Oceanography (SIO), San Diego, CA, clearly show that the technique is impractical. The technical difficulties are associated with the failure of several necessary assumptions of shape from reflection. The first assumption is that the 'sky' illumination source is nearly isotropic; in practice, this assumption is not valid. The second assumption is that the nonlinear relationship between the reflection coefficient and wave slope is not a fundamental limiting factor; in practice, the sensitivity of the reflection coefficient to incidence angle appears to be a limiting factor. The technique of measuring the ocean wave spectrum by shape from reflection is not viable and should not be pursued. DTIC

N94-33445 Woods Hole Oceanographic Inst., MA.
[THE STUDY OF THE MEDITERRANEAN OUTFLOW] Final Report
James F. Price 15 Dec. 1993 4 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-J-1053)
(AD-A277742) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A detailed survey of the Mediterranean outflow in the Gulf of Cadiz was made with special emphasis on the regions where the outflow mixes most rapidly with the overlying North Atlantic water. This new data set gave an unprecedented view of the dynamics of a marginal sea outflow. A second major effort was to develop models of marginal sea outflows. Four major outflows that supply new water to the thermohaline circulation were dealt with providing considerable insight into the dynamics and possible climate consequences of these outflows. Derived from text

N94-33592 Naval Undersea Warfare Center, Newport, RI.
A PREDICTIVE PARAMETRIC MODEL FOR VOLUME SCATTERING STRENGTH IN THE DEEP OCEAN WITH AN APPLICATION TO NIGHTTIME NEAR-SURFACE SCATTERING IN THE NORTH SARGASSO SEA BELOW 16 kHz Final Report
R. A. Saenger and Wendy L. Wachter 1 Oct. 1993 49 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277902; NUWC-NPT-TR-10405) Avail: CASI HC A03

In the deep ocean, long range active sonars are often volume reverberation limited at night due to scattering from the gas-filled swimbladders of mesopelagic fish in near-surface waters. To predict the detection performance of these sonars with a general sonar model, volume scattering strength profiles S(sub v)(z,f) are needed as inputs. A general

volume scattering strength model (VSSM) for nighttime/daytime S(sub v)(z,f) profiles in a deep water faunal province is described. Explicit expressions are developed for the average length-depth distribution of bladdered fish, the corresponding swimbladder radius-depth distribution, and volume scattering strength S(sub v)(z,f). A specific nighttime near-surface VSSM is developed for the North Sargasso Sea faunal province using data from Ocean Acre experiment 12. A VSSM of very simple form is found capable of describing measured nighttime profiles at 3.85 and 15.5 kHz to a depth of 225 m. This agreement, however, could only be obtained by modifying model parameters obtained from trawl data to correct for sampling deficiencies, principally net avoidance by the larger fish. Predictions with the modified VSSM at 1 kHz suggest that in the nighttime 0-50 m surface layer, S(sub v) levels were as high as -75 dB due to scattering from these larger fish. DTIC

N94-33671 Coastal Engineering Research Center, Vicksburg, MS.
THREE-PARAMETER CHARACTERIZATION OF SHALLOW-WATER DIRECTIONAL WIND WAVE SPECTRA Final Report
Charles E. Long Jan. 1994 131 p Sponsored by Corps of Engineers
Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278532; CERC-94-1) Avail: CASI HC A07

A 5-year, 6,759-case database of high resolution, shallow-water, frequency-direction spectra is examined by classifying spectra in discrete ranges of three parameters: characteristic wave height, spectral peak frequency, and spectral peak direction. Counting the number of cases in each classification reveals the distribution of the spectral population in the three-parameter domain. Averaging spectra within parametric classes defines characteristic spectra that can be used to describe nearshore wave conditions more completely when only three parameters are known or estimated. Though the results are specifically unique to the North Carolina outer banks experiment site (the Field Research Facility of the U.S. Army Engineer Waterways Experiment Station Coastal Engineering Research Center), they are illustrative of the variability of wave energy distributions possible in nature. Computation of longshore energy fluxes and radiation stress tensor components using characteristic spectra and the three-parameter guidance of the Shore Protection Manual reveals significant differences, and suggests that the ability to measure directional distributions of wave energy with high resolution is critical to the further improvement of modeling and predictive ability. DTIC

N94-33767 Naval Postgraduate School, Monterey, CA.
CHARACTERIZATION OF TIDAL CURRENTS IN MONTEREY BAY FROM REMOTE AND IN-SITU MEASUREMENTS M.S. Thesis
Emil T. Petruncio Dec. 1993 120 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277844) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A first order description of tidal heights and currents in Monterey Bay is provided. Analysis of sea level records indicate that a mixed, predominantly semidiurnal tide nearly co-oscillates within the bay. Analysis of month-long moored ADCP records obtained in the winter and summer of 1992 reveals that tidal-band currents account for approximately 50 percent of the total current variance in the upper ocean (20-200 m). A relatively strong (7 cm/s) fortnightly tide (MSf) is present in both seasons. Considerable rotation of the semidiurnal ellipse orientations occurs with depth during both seasons. A month-long record of surface current measurements obtained with CODAR, an HF radar system, during Sep. 1992 reveals that the Monterey Submarine Canyon clearly influences the strength and direction of semidiurnal (M2) tidal currents. Good agreement exists between the strength and orientation of ADCP- and CODAR-derived tidal ellipses, with the exception of the constituent K1. Large, spatially uniform K1 surface currents (20-30 cm/s) appear to be the result of diurnal sea breeze forcing. DTIC

N94-33775 Woods Hole Oceanographic Inst., MA.
BOTTOM BOUNDARY LAYER STRESS MEASUREMENTS WITH BASS TRIPODS: DATA REPORT STRESS 1988-1989
Thomas F. Gross and Albert J. Williams Nov. 1993 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contracts N00014-89-J-1058; N00014-90-J-1046)
(AD-A277864; WHOI-93-46) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Two Benthic Acoustic Stress Sensor (BASS) equipped tripods were deployed in the Sediment Transport Events on Shelves and Slopes (STRESS) experiment in Nov. 1988 and recovered in Mar. 1989 on the California Shelf. They measured velocity profiles in the bottom boundary layer over the lowest 5 meters. Transmissometers, thermistors, and a pressure sensor on each tripod provided suspended sediment concentration, stratification, and wave spectral information, as well. DTIC

N94-33831# Naval Research Lab., Bay Saint Louis, MS.
A GEOACOUSTIC MODEL FOR FINE-GRAINED, UNCONSOLIDATED CALCAREOUS SEDIMENTS (ARSRP NATURAL LABORATORY) Final Report
Frederick A. Bowles 9 Mar. 1994 57 p
(AD-A277830; NRL/MR/7432-93-7082) Avail: CASI HC A04/MF A01

This report presents a geoacoustic model that is broadly applicable to deep ocean areas that are covered with soft, finegrained, predominantly calcareous sediment. The model is based on a compilation and assessment of sediment (geoacoustic) properties deemed important as input parameters to acoustic field models. Physical properties measurements (compressional wave velocity, shear wave velocity, density, porosity) extracted from Deep Sea Drilling Project and Ocean Drilling Program Initial Reports provide the bulk of the accumulated data. Attenuation data and additional shear wave data were obtained from other sources. The data are presented as follows: (1) statistical summaries; (2) cross-plots illustrating the relationships between properties; and (3) regression equations. Empirically derived relationships commonly used to prepare geoacoustic models are not employed by this model. A discussion is presented in order to document the reasoning and, ultimately, the choices made in constructing the model. DTIC

N94-33922# Naval Postgraduate School, Monterey, CA.
A COMPARISON OF MODELED AND OBSERVED OCEAN MIXED LAYER BEHAVIOR IN A SEA BREEZE INFLUENCED COASTAL REGION M.S. Thesis
Patrick S. Cross 21 Dec. 1993 125 p
(AD-A277911) Avail: CASI HC A06/MF A02

A high temporal resolution data set from a mooring in Monterey Bay, California was analyzed and used to calculate heat and momentum fluxes for the purpose of forcing two ocean mixed layer models. The time frame for the study was Sep. 1992, a period representative of the sea breeze circulation frequently affecting this and other coastal regions. The models used were that of Price, Weller and Pinkel (1986), a Richardson number based mixing model, and Garwood (1977), a model based on the turbulent kinetic energy budget within the mixed layer. Both models were analyzed with respect to their ability to reproduce the observed diurnal variation of the temperature and depth of the mixed layer. Although the model predictions agree reasonably well with observations in regards to the phase of the diurnal temperature cycle, they were seen to underpredict its magnitude, particularly the noctural cooling. This lack of cooling in the models relative to the ocean could be due to penetrative convection, non-steady state turbulence, and/or diurnal advection present in the ocean but not in one or both models. Additionally, the models exhibited an upward temperature trend relative to the data which caused progressively increasing stratification. This trend was used to approximate the magnitude of vertical advective effects. DTIC

N94-34121# Swedish Meteorological and Hydrological Inst., Norkoeping (Sweden).
COUPLED ICE-OCEAN MODEL SUPPORTING WINTER NAVIGATION IN THE BALTIC SEA. PART 1: ICE DYNAMICS AND WATER LEVELS
A. Omstedt, L. Nyberg, and M. Leppaeranta Jan. 1994 23 p
(PB94-148780; SMHI-RO-17-1994-Pt-1) Avail: CASI HC A03/MF A01

A sea ice forecasting system for the Baltic Sea is presented together with some illustrations. The model is a dynamic coupled model, consisting of both a sea ice and a storm surge model. The model was forced using wind and pressure fields from the HIRLAM system and was introduced in preoperational tests during the winter of 1992/93. In general, the results were most promising, but further work is needed, particularly the inclusion of thermodynamics to the model, a closer coupling between the ice-ocean model and the HIRMLAM model, and the development of an automatic method for the generation of initial data to the model. NTIS

N94-34142 National Defence Research Establishment, Stockholm (Sweden). Dept. of Weapon Systems, Effects and Protection.
OCEAN MAGNETICS [HAVSMAGNETIK]
O. Beckman Dec. 1993 46 p In SWEDISH
(PB94-149028; FOA-C-20953-2.2) Avail: Issuing Activity (National Technical Information Service (NTIS))

The wave motion of seawater in the geomagnetic field generates weak oscillating magnetic and electric fields. The magnetic fields may give a background noise in magnetic loop systems. The first part of the report gives a general survey of wind generated waterwaves with special reference to the wave spectrum as related to wind speed and fetch. The report gives further the theoretical background to ocean magnetism with calculation of wave generated magnetic and electric fields. A theoretical analysis is given of three specific experimental measurements: (1) The spectrum of windwaves has been used for the analysis of noise in the measurements of pressure variations at the sea bottom; (2) The windwaves are shown to cause a noise in magnetic loop systems; and (3) An analysis is given of the measurements of electric fields induced by the wake of a fast moving ship. NTIS

N94-34143# Swedish Meteorological and Hydrological Inst., Norkoeping (Sweden).
OPERATIONAL BALTIC SEA CIRCULATION MODEL. PART 1: BARATROPIC VERSION
L. Funkquist Dec. 1993 19 p
(PB94-149101; SMHI-RO-18-1993-Pt-1) Avail: CASI HC A03/MF A01

This report describes the application of a barotropic circulation model to the Baltic Sea. The model is designed to be run operationally and is easily modified for specific circulation studies. In the operational mode, it will give daily forecasts on water level and water transports. Coupled to an ice growth model, it will also be possible to make forecasts of ice cover change and ice drifts. Further, it will act as a basic part of a modeling system for oil drift and spreading of chemicals. NTIS

N94-34203# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EOF CHARACTERIZATION OF ATLANTIC SST FIELDS USING AVHRR DATA M.S. Thesis [CARACTERIZACAO DOS MODOS PRINCIPAIS DE VARIABILIDADE DOS CAMPOS DE TSM NO ATLANTICO UTILIZANDO DADOS AVHRR]
Milton Kampel Dec. 1993 122 p In PORTUGESE
(INPE-5535-TDI/523) Avail: CASI HC A06/MF A02

We present here an EOF study of sea surface temperature (SST) variability in the tropical-subtropical Atlantic basin (45 N - 45 S), between 1989-91, with higher resolution in space and time than previous published works. The study was based on the MCSST, weekly average, 18 km x 18 km, gridded SST data distributed by NODS/JPL, based on the AVHRR data transmitted from the NOAA satellite platforms. In this study, 155 weekly images were statistically analyzed, including expansion in empirical orthogonal function (EOF) image eigenvectors and maximum entropy spectral analysis (MESA) of the corresponding principal components time series. The first three EOF's accounted for 87 percent of the total variance, which was shown to be dominated by the annual cycle (78.5 percent), followed by the well known interannual, quasibiennial signal (29 months), only acceptable here by comparing with results from other authors. The intraseasonal signals appeared in the third eigenmode. The first EOF showed a large area in the western tropical Atlantic where the annual cycle has a minimum. By subjecting this sub-area to the same kind of analysis, we were able to show that the interannual variance, pertaining to the second mode, accounted for 37 percent of the total, while the annual cycle accounted for 41 percent. The method permitted identification of interference patterns of reflected equatorial modes and SST anomaly patterns due to upwelling, western boundary currents and eddy fields. Author (revised)

N94-34209*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SeaWIFS TECHNICAL REPORT SERIES. VOLUME 17: OCEAN COLOR IN THE 21ST CENTURY. A STRATEGY FOR A 20-YEAR TIME SERIES
Mark R. Abbott (Oregon State Univ., Corvallis.), Otis B. Brown (Miami Univ., FL.), Robert H. Evans (Miami Univ., FL.), Howard R. Gordon (Miami Univ., FL.), Kendall L. Carder (University of South Florida, Saint Petersburg.), Frank E. Mueller-Karger (National Aeronautics and Space Administration, Washington, DC.), Wayne E. Esaias, Stanford B. Hooker, and Elaine R. Firestone Jun. 1994 22 p
(NASA-TM-104566-Vol-17; Rept-94B00091-Vol-17; NAS 1.15:104566-Vol-17) Avail: CASI HC A03/MF A01

Beginning with the upcoming launch of the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), there should be almost continuous measurements of ocean color for nearly 20 years if all of the presently planned national and international missions are implemented. This data set will present a unique opportunity to understand the coupling of physical and biological processes in the world ocean. The presence of multiple ocean color sensors will allow the eventual development of an ocean color observing system that is both cost effective and scientifically based. This report discusses the issues involved and makes recommendations intended to ensure the maximum scientific return from this unique set of planned ocean color missions. An executive summary is included with this document which briefly discusses the primary issues and suggested actions to be considered. Author (revised)

N94-34265*# National Academy of Sciences - National Research Council, Washington, DC. Commission on Geosciences, Environment, and Resources.
OCEANOGRAPHY IN THE NEXT DECADE: BUILDING NEW PARTNERSHIPS
1992 218 p Sponsored in part by NSF, Office of Naval Research, NOAA, Geological Survey, DOE and NASA, Washington Original contains color illustrations
(NASA-CR-195926; NAS 1.26:195926; ISBN-0-309-04794-3; LC-92-34458) Avail: CASI HC A10/MF A03; 5 functional color pages

The field of oceanography has existed as a major scientific discipline in the United States since World War 2, largely funded by the federal government. In this report, the Ocean Studies Board documents the state of the field of oceanography and assesses the health of the partnership between the federal government and the academic oceanography community. The objectives are to document and discuss important trends in the human, physical, and fiscal resources available to oceanographers, especially academic oceanographers, over the last decade; to present the Ocean Studies Board's best assessment of scientific opportunities in physical oceanography, marine geochemistry, marine geology and geophysics, biological oceanography, and coastal oceanography during the upcoming decade; and to provide a blueprint for more productive partnerships between academic oceanographers and federal agencies. Derived from text

N94-34375 Coastal Engineering Research Center, Vicksburg, MS.
OBSERVATIONS AND MODELLING OF WINDS AND WAVES DURING THE SURFACE WAVE DYNAMICS EXPERIMENT. REPORT 2: INTENSIVE OBSERVATION PERIOD IOP-3 Technical Report, 25 Feb. - 9 Mar. 1991
Michael J. Caruso, Hans C. Graber, Robert E. Jensen, and Mark A. Donelan Mar. 1994 291 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contracts N00014-90-J-1464; N00014-92-J-1546)
(AD-A278368; CERC-93-6-2) Avail: CASI HC A13

This report describes the compilation of observed and modelled wind, wave, and current parameters during the third intensive observation period (IOP-3) from 25 Feb. to 9 Mar. 1991, of the Surface Wave Dynamics Experiment. The measurements include wind speed and direction, wave heights and periods, air and sea temperatures, and atmospheric pressures from four directional wave buoys, two meteorological buoys, and several routinely operated buoys from the National Data Buoy Center (NDBC). Examples of directional wave spectra obtained from two airborne radars and from a Swath ship are presented along with surface currents from airborne expendable current profilers (AXCP) and acoustic doppler current profilers (ADCP). In addition, a summary of directional wave spectra is presented for this period. The model data include examples of wind fields from six numerical weather prediction models and the corresponding wave height maps as derived from the 3G-WAM ocean wave model. Estimated surface current velocities and directions from the Fleet Numerical Oceanographic Center (FNOC) model and selected satellite images of sea surface temperature fields are also presented for this time period. DTIC

N94-34412*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SeaWIFS TECHNICAL REPORT SERIES. VOLUME 16: THE SECOND SeaWIFS INTERCALIBRATION ROUND-ROBIN EXPERIMENT, SIRREX-2, JUNE 1993
Stanford B. Hooker, ed., Elaine R. Firestone, ed., James L. Mueller, James T. McLean, B. Carol Johnson, Todd L. Westphal, and John W. Cooper May 1994 124 p
(RTOP 900-00-00)
(NASA-TM-104566-Vol-16; Rept-94B00081-Vol-16; NAS 1.15:104566-Vol-16) Avail: CASI HC A06/MF A02

The results of the second Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Intercalibration Round-Robin Experiment (SIRREX-2), which was held at the Center for Hydro-Optics and Remote Sensing (CHORS) at San Diego State University on 14-25 Jun. 1993 are presented. SeaWiFS is an ocean color radiometer that is scheduled for launch in 1994. The SIRREXs are part of the SeaWiFS Calibration and Validation Program that includes the GSFC, CHORS, NIST, and several other laboratories. GSFC maintains the radiometric scales (spectral radiance and irradiance) for the SeaWiFS program using spectral irradiance standards lamps, which are calibrated by NIST. The purpose of each SIRREX is to assure that the radiometric scales which are realized by the laboratories who participate in the SeaWiFS Calibration and Validation Program are correct; that is, the uncertainties of the radiometric scales are such that measurements of normalized water-leaving radiance using oceanographic radiometers have uncertainties of 5%. SIRREX-1 demonstrated, from the internal consistency of the results, that the program goals would not be met without improvements to the instrumentation. The results of SIRREX-2 demonstrate that spectral irradiance scales realized using the GSFC standard irradiance lamp (F269) are consistent with the program goals, as the uncertainty of these measurements is assessed to be about 1%. However, this is not true for the spectral radiance scales, where again the internal consistency of the results is used to assess the uncertainty. This is attributed to inadequate performance and characterization of the instrumentation. For example, spatial nonuniformities, spectral features, and sensitivity to illumination configuration were observed in some of the integrating sphere sources. The results of SIRREX-2 clearly indicate the direction for future work, with the main emphasis on instrument characterization and the assessment of the measurement uncertainties so that the results may be stated in a more definitive manner. Author (revised)

51 LIFE SCIENCES (GENERAL)

N94-33564* National Aeronautics and Space Administration, Washington, DC.
ASSISTING WINE GROWERS (Videotape)
1993 Videotape: 6 min. 25 sec. playing time, in color, with sound
(NASA-TM-109812; NONP-VT-94-12940) Avail: CASI VHS A01/BETA A22

This video documents efforts at NASA Ames Research Center to assist wine growers in the Napa valley in their fight against a root parasite which is destroying millions of dollars worth of grape crops. NASA researchers are using airborne scanners and remote sensing equipment to detect the parasite before it becomes entrenched, so that growers can treat the harvest to resist infestation. CASI

N94-33734# Los Alamos National Lab., NM.
PHASE-SENSITIVE FLOW CYTOMETRY: NEW TECHNOLOGY FOR ANALYZING BIOCHEMICAL, FUNCTIONAL, AND STRUCTURAL FEATURES IN FLUOROCHROME-LABELED CELLS AND PARTICLES
J. A. Steinkamp 1993 4 p Presented at the 4th Laser Applications to Chemical Analysis Meeting, Jackson Hole, WY, 8-11 Mar. 1994
(Contract W-7405-eng-36)
(DE94-003960; LA-UR-93-3960; CONF-940341-2) Avail: CASI HC A01/MF A01

Flow cytometry (FCM) instruments rapidly measure biochemical, functional, and cytological properties of individual cells and macromolecular components, e.g., chromosomes, for clinical diagnostic medicine and biomedical and environmental research applications. These measurements are based on labeling cells with multiple fluorochromes for correlated analysis of macromolecules, such as DNA, RNA, protein, and cell-surface receptors. This report describes the development of a phase-sensitive flow cytometer that provides unique capabilities for making laser-excited, phase-resolved measurements on fluorochrome-labelled cells and particles. DOE

N94-33770* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
KSC WILDLIFE SHOW (Videotape)
[1994] Videotape: 30 min. playing time, in color, with sound
(NASA-TM-109808; NONP-VT-94-12936) Avail: CASI VHS A01/BETA A22

This video highlights footage of the many forms of animal and plant life that inhabit the environs surrounding KSC. Shown are birds, alligators, butterflies, and plants as they react to shuttle launches and other activities eminating from KSC. CASI

N94-34008# Stanford Univ., CA. Dept. of Biological Sciences.
ENZYMOLOGY AND MOLECULAR BIOLOGY OF CELL WALL BIOSYNTHESIS
P. M. Ray 20 Mar. 1993 7 p
(Contract DE-FG03-91ER-20048)
(DE94-008585; DOE/ER-20048/2) Avail: CASI HC A02/MF A01

In order to be able to explore the control of cell wall polysaccharide synthesis at the molecular level, which inter alia might eventually lead to means for useful modification of plant biomass polysaccharide production, the immediate goals of this project are to identify polypeptides responsible for wall polysaccharide synthase activities and to obtain clones of the genes that encode them. We are concentrating on plasma membrane-associated (1,3)-beta-glucan synthase (glucan synthase-II or GS-II) and Golgi-associated (1,4)-(beta)-glucan synthase (glucan synthase-I or GS-I), of growing pea stem tissue. Our progress has been much more rapid with respect to GS-II than regarding GS-I. DOE

N94-33658*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CONTINUOUS MONITORING OF BACTERIAL ATTACHMENT Abstract Only
D. W. Koeing (Krug Life Sciences, Inc., Houston, TX.), S. K. Mishra (Krug Life Sciences, Inc., Houston, TX.), and D. L. Pierson *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 599 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N94-33380# Yale Univ., New Haven, CT. School of Medicine.
CELLULAR ANALYSIS OF THE STARTLE REFLEX Annual Report, 1 Sep. 1992 - 31 Aug. 1993
Michael Davis 31 Aug. 1993 2 p
(Contract F49620-92-J-0300)
(AD-A278243; AFOSR-94-0224TR) Avail: CASI HC A01/MF A01

In the ASSERT Award we are interested in how dopamine agonists affect baseline startle amplitude as well as the phenomenon of pre-pulse inhibition. To test this, we have been recording the compound action potential generated by an auditory stimulus at the level of the cochlear nucleus in freely moving rats using a bundle of four previously implanted 25 micrometers nichrome wires. Each of the dopamine agonists increased the amplitude of the auditory nerve response (NI component, latency =0.75 msec). This effect is larger following repeated administration of d-amphetamine on each of 7 days, indicating that it shows sensitization. This suggests that dopamine agonists ultimately can alter processes at the very beginning of the auditory system, which we believe may have considerable relevance for dopamine-induced disruption of auditory prepulse inhibition as well as auditory distractibility and even auditory hallucinations in people. DTIC

N94-33545# Armed Forces Inst. of Pathology, Washington, DC.
EFFECT OF BARBITURATES AND HYPEROXIA ON LIPID PEROXIDATION IN HYPOXIC NEURONS Annual Technical Report, Apr. 1992 - Apr. 1993
William J. Mehm 15 Apr. 1993 2 p
(Contract F49620-92-J-0166)
(AD-A278467; AFOSR-94-0220TR) Avail: CASI HC A01/MF A01

This grant was funded for the project 'Effects of Barbiturates and Hyperoxia on Lipid Peroxidation in Hypoxic Neurons' with Chiger, Anderson and Mehm as investigators. The principle investigator departed before any research began. When a new investigator arrived, we found that the proposed model was not appropriate for the research question. We have proposed a change in the research protocol and principle investigator and have requested a not-cost extension. The proposed protocol is 'Oxygen Tension Effects on Wound Healing Molecular Mechanisms' with Kulesh, Anderson and Mehm as investigators. Since that request has not yet been approved, no research has been done. DTIC

N94-33708 Boston Univ., MA.
A SELF-ORGANIZING NEURAL NETWORK ARCHITECTURE FOR AUDITORY AND SPEECH PERCEPTION WITH APPLICATIONS TO ACOUSTIC AND OTHER TEMPORAL PREDICTION PROBLEMS Annual Report, 1 May 1992 - 30 Apr. 1993
Stephen Grossberg and Michael Cohen Jan. 1994 13 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0225)
(AD-A277526; AFOSR-94-0107TR) Avail: CASI HC A03

This project is developing autonomous neural network models for the real-time perception and production of acoustic and speech signals. A new acoustic filter was developed to show how coarticulated context-sensitive auditory signals can be separated and represented in a more context-independent fashion, thereby easing the recognition problem. Parallel processing streams sensitive to sustained and transient signals are used, as in vision. A model of working memory was developed that automatically compensates for variable acoustic or speech rates. The model shows how invariance of the short term storage of variable-rate acoustic streams can explain data about categorical boundary shifts when the distributions of silent intervals or of vowel durations are altered. New learning and categorization nets were shown to discriminate vowels with comparable accuracy but much higher compression than alternative methods. Models of skilled motor control were developed to clarify how speech and arm movements can be planned and flexibly modified by task requirements. Studies of neural oscillators suggest how rhythmic behaviors relevant to perception and action, notably synchronous oscillations, may be generated and controlled. DTIC

N94-33779 Wright State Univ., Dayton, OH. Dept. of Psychology.
PATTERN ANALYSIS BASED MODELS OF MASKING BY SPATIALLY SEPARATED SOUND SOURCES Annual Progress Report, 15 May 1992 - 14 May 1993
Robert H. Gilkey 15 Jun. 1993 14 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0289-91)
(AD-A277882; AFOSR-94-0137TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Research is described in three areas: masked detection, sound localization, and neural network models of sound localization. Work on masked detection indicates that substantial reductions in masking of 8 to 18 dB can be realized when the signal is spatially separated from the masker in the free-field. This reduction in masking appears to be mediated by high-frequency information. Headphone-based studies of reproducible noise masking question traditional models of binaural masking, by showing unexpected relations between responses under monaural and binaural conditions. A new response technique was developed to support work on sound localization. Neural network models of sound localization based on binaural stimulus cues can produce responses comparable to those of human observers. Our efforts in laboratory development and in planning the Conference on Binaural and Spatial Hearing are also briefly described. DTIC

N94-34005# Naval Medical Research and Development Command, Bethesda, MD.
A MODEL FOR PREDICTING CENTRAL NERVOUS SYSTEM TOXICITY FROM HYPERBARIC OXYGEN EXPOSURE IN MAN: EFFECTS OF IMMERSION, EXERCISE, AND OLD AND NEW DATA Technical Report, 1987 - 1994
A. L. Harabin, S. S. Survanshi, and L. D. Homer Mar. 1994 36 p
(AD-A278348; NMRI-94-0003) Avail: CASI HC A03/MF A01

We analyzed symptoms of central nervous system (CNS) oxygen toxicity from 1726 controlled human hyperbaric O2 exposures at PO2 (Partial pressure of O2) levels ranging from 0.3 to 2.9 atmospheres (atm) using risk models and maximum likelihood analysis, and tested specific hypotheses with likelihood ratios. The data were sorted into dry and immersed, no-exercise, and exercise conditions; new studies were separated from those before 1972. The analysis showed that CNS toxicity, in contrast to pulmonary, increases non-linearly with O2 level (power on O2 greater than 2) and time: the longer an exposure has been, the riskier additional exposure becomes (power on time greater than 1.2). Immersion and exercise each significantly increased the risk of toxicity at any PO2 and time combination. Older studies of immersed, exercised subjects predicted significantly more risk than new studies conducted under comparable conditions and could not be combined for parameter estimation. Reasons for this incompatibility are discussed. Parameters obtained from only the new data predict that current U.S. Navy depth/time limits for O2 diving should keep the incidence of O2 toxicity below 1%, provided recommended purging procedures are followed. DTIC

N94-34111 Oxford Univ. (England). Programming Research Group.
FORMAL DESIGN AND EVALUATION OF A VARIETY OF MEDICAL DIAGNOSTIC PROGRAMS
B. S. Todd and R. Stamper 1993 145 p
(PB94-149622; PRG-109) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

This monograph documents some experiments on computer-aided diagnosis carried out to investigate the effect on diagnostic accuracy of using various statistical and knowledge-based methods to take dependencies between clinical observations into account. The authors present detailed specifications of a variety of statistical and knowledge-based programs within a common formal framework using the Z specification language. They describe how they collected a retrospective database of 1270 cases of abdominal pain of suspected gynecological origin. They used this to evaluate all methods. The results show that no significant improvement in accuracy can be made by taking interactions into account; independence Bayes is optimal in this application. However, the nearest neighbors method using a new metric appears to be at least as accurate. The authors argue that the nearest neighbors method is more suitable for clinical use than the direct application of independence Bayes because of improved accountability. The computer analysis is encoded and displayed to the user as a small set of actual cases that presented similarly to the new case. The user can retrieve these cases and inspect both their presentations and outcomes if he wishes. The ability to justify and support decisions in this way should be invaluable in safety-critical fields such as medical diagnosis. NTIS

N94-34602* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 390)
Jul. 1994 53 p
(NASA-SP-7011(390); NAS 1.21:7011(390)) Avail: CASI HC A04

This bibliography lists 102 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System. Subject coverage includes: life sciences (general), aerospace medicine, behavioral sciences, man/system technology and life support, and space biology. Author

N94-34695 Southwest Research Inst., San Antonio, TX.
EVALUATION OF PULSED DOPPLER BUBBLE DETECTION Final Report, 1 Oct. 1988 - 30 Sep. 1989
Hegeon Kwun, W. D. Jolly, and D. G. Alcazar Mar. 1994 44 p Limited Reproducibility: More than 20% of this document may be affected

by microfiche quality
(Contracts DLA900-84-C-0910; MIPR-FQ7624-89-000001; AF Proj. 7930)
(AD-A277920; AL/CF-TP-1994-0006) Avail: CASI HC A03

The High Altitude Protection Function of the Crew Technology Division has used a portable Doppler array to monitor venous gas emboli in human research subjects exposed to reduced high altitudes. The existing Doppler equipment was limited in that subjects were required to maintain a specific body position to achieve consistent bubble grade analysis, especially during exercise. It was surmised that engineering modifications might resolve the dilemma. The target frequency and sound wave pulses were to be modified to maintain focus on the precordium allowing for continuous tracking of bubble sounds. A prototype, pulsed-wave, Doppler bubble detection instrument with transducers was designed and developed. This system demonstrated greater depth of penetration and the ability to localize the interrogation area; however, altitude simulation tests revealed the prototype to be unsatisfactory due to the high level of noise generated internally by the CW Doppler circuitry. Recommendations were made of redesign, but development was not pursued due to funding limitations. Also Doppler echo imaging was found to provide equal if not better analysis of bubble grades with the addition of visual cues to ensure accurate placement and timely monitoring regardless of physical activity. DTIC

N94-33499*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OVERVIEW OF NASA HUMAN RESPONSE TO SONIC BOOM PROGRAM
Kevin P. Shepherd *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1287-1291 (For primary document see N94-33487 10-02)
Avail: CASI HC A01/MF A06

N94-33637*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RESPONSE TO GRADED LOWER BODY NEGATIVE PRESSURE (LBNP) AFTER SPACE FLIGHT Abstract Only
S. Fortney, J. Charles, M. Wood, and T. Dussack *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 495 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33638*# Krug Life Sciences, Inc., San Antonio, TX.
DUAL-CYCLE ERGOMETRY AS AN EXERCISE MODALITY DURING PREBREATHE WITH 100 PERCENT OXYGEN Abstract Only
Cristine L. Heaps, Michele D. Fischer, and James T. Webb *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 496 Prepared in cooperation with Aerospace Medical Research Labs., Brooks AFB, TX (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33639*# Krug Life Sciences, Inc., San Antonio, TX.
EXERCISE WITH PREBREATHE APPEARS TO INCREASE PROTECTION FROM DECOMPRESSION SICKNESS: PRELIMINARY FINDINGS
James T. Webb, Michele D. Fischer, Cristine L. Heaps, and Andrew A. Pilmanis *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 497-500 Sponsored in part by Aerospace Medical Research Labs. (For primary document see N94-33612 10-99)
(Contracts NASA Order T-82170; F33615-89-C-0603; F33615-92-C-0018)
Avail: CASI HC A01/MF A03

N94-33640*# Army Research Inst. of Environmental Medicine, Natick, MA.
ORTHOSTATIC RESPONSES TO DIETARY SODIUM RESTRICTION DURING HEAT ACCLIMATION
Patricia C. Szlyk, Ingrid V. Sils, David M. Caretti, Robert J. Moore, Lawrence E. Armstrong, Kim A. Tartarini, Ralph P. Francesconi, Eldon W. Askew, and Roger W. Hubbard *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 501-508 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33641*# Naval Air Warfare Center, China Lake, CA.
TELEMEDICINE, VIRTUAL REALITY, AND SURGERY
Percival D. McCormack and Steve Charles *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 509-521 (For primary document see N94-33612 10-99)
Avail: CASI HC A03/MF A03

N94-33643*# Aerospace Medical Research Labs., Brooks AFB, TX.
THE EFFECTIVENESS OF GROUND LEVEL POST-FLIGHT 100 PERCENT OXYGEN BREATHING AS THERAPY FOR PAIN-ONLY ALTITUDE DECOMPRESSION SICKNESS (DCS)
John T. Demboski and Andrew A. Pilmanis *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 532-537 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33644*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EMERGENCY MEDICAL SERVICES
Roger Billica and Michael Chandler *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 538-539 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33645*# Army Inst. of Dental Research, Fort Meade, MD.
QUANTITATIVE 3-D IMAGING TOPOGRAMMETRY FOR TELEMEDICINE APPLICATIONS Abstract Only
Bruce R. Altschuler *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 553 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33647*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE PORTABLE DYNAMIC FUNDUS INSTRUMENT: USES IN TELEMEDICINE AND RESEARCH Abstract Only
Norwood Hunter (Krug Life Sciences, Inc., Houston, TX.), Michael Caputo (Krug Life Sciences, Inc., Houston, TX.), Roger Billica, Gerald Taylor, C. Robert Gibson, F. Keith Manuel, Thomas Mader, and Richard Meehan *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 555-556 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33651*# Army Research Inst. of Environmental Medicine, Natick, MA. Environmental Physiology and Medical Directorate.
HYDRATION AND BLOOD VOLUME EFFECTS ON HUMAN THERMOREGULATION IN THE HEAT: SPACE APPLICATIONS
Michael N. Sawka, Richard R. Gonzalez, and Kent B. Pandolf *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 567-573 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34025*# Dartmouth-Hitchcock Medical Center, Lebanon, NH.
SURGERY APPLICATIONS OF VIRTUAL REALITY Abstract Only
Joseph Rosen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 50 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N94-33595 New York Univ., New York, NY. Dept. of Psychology.
VISUAL MOTION PERCEPTION AND VISUAL INFORMATION PROCESSING Annual Report, 1 Feb. 1992 - 31 Dec. 1993
George Sperling 31 Dec. 1993 22 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0178-91)
(AD-A278530; AFOSR-94-0205TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This project concerned the discovery and description of basic mechanisms of human visual motion and texture perception. Motion and texture are critical inputs to visual perception. Basic mechanisms of motion are of particular interest because they are perhaps the primary substrate for perceptual recovery of 3D depth structures and orientation in space. They are critical for detecting new objects and events in the environment, as well as playing an important role in 2D perception. Motion and texture are considered together here because the problem of discriminating velocity in a one-dimensional motion stimulus is formally equivalent to the problem of discriminating orientation in a texture stimulus: the t dimension of the motion stimulus becomes the y dimension of the texture stimulus. DTIC

N94-33674# Johns Hopkins Univ., Baltimore, MD. Dept. of Psychology.
STOCHASTIC MODELS OF ATTENTION AND SEARCH Annual Report, 1 Mar. 1993 - 28 Feb. 1994
Steven Yantis 28 Feb. 1994 20 p
(Contract F49620-92-J-0186)
(AD-A278538; AFOSR-94-0247TR) Avail: CASI HC A03/MF A01

Six lines of experimentation have been continued. In the first set of experiments, the PI has tested and rejected a two-process model of visual attention allocation. He has proposed an alternative perceptual sampling model and performed stochastic simulations of the model to show that it can account for certain aspects of human performance in cued visual search tasks. In the second set of experiments, the PI has found evidence that observers perceive occluded objects across time, a finding that complements an analogous ability to perceptually complete partially occluded objects across space. Several lines of experimentation have been carried our using a bistable apparent motion display (the Ternus display) as a tool to explore the assignment of object identity over time. For example, the PI has found evidence that a common mechanism may underlie the perception of bistable apparent motion and the capture of visual attention in certain visual search tasks, and he has discovered that perceptual grouping by proximity can precede the assignment of motion correspondences in bistable apparent motion. In the fifth project, the PI has shown that visual salience is not sufficient to produce attentional capture; a deliberate state of attentional readiness is required to guide attention according to salient stimulus attributes. DTIC

N94-33700 Rutgers - The State Univ., New Brunswick, NJ. Dept. of Psychology.
EYE MOVEMENTS AND VISUAL INFORMATION PROCESSING Annual Report, 30 Sep. 1992 - 29 Sep. 1993
Eileen Kowler 29 Sep. 1993 7 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0342-91)
(AD-A278364; AFOSR-94-0143TR) Avail: CASI HC A02

When we look around a natural environment the eye is directed toward objects we select. We seem to do this task accurately and effortlessly. Yet, even such a simple task presents real problems for the oculomotor system, namely, to select the relevant target from the detailed background so that only information contained in it influences the line of sight and to spatially pool information in the selected target so that the line of sight lands at a single position within the selected target. We have found that the saccadic target is designated by means of selective perceptual attention, which means people cannot prepare to look to one target while accurately perceiving targets elsewhere, and there is a highly-accurate spatial pooling process which can direct the line of sight to precise positions within large targets. The results show that the oculomotor system is capable of extremely rapid and effective scanning. The procedures humans use to accomplish this task may prove useful for the guidance of robotic systems which need to move about in patterned visual environments. DTIC

N94-33737 Symbus Technology, Inc., Waltham, MA.
WORKSHOP ON SELF-DETERMINATION IN DEVELOPING AND EVOLVING SYSTEMS Final Report, 15 Dec. 1993 - 14 Jan. 1994
Michael Kuperstein 18 Feb. 1994 63 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-94-C-0011)
(AD-A278367; AFOSR-94-0188TR) Avail: CASI HC A04

Self-determined systems are usually studied by researchers with unrelated terminology and few known common principles. This workshop was aimed at bringing together scientists whose research directly confronts the problems of analyzing, explaining, and building self-determined systems. We hoped that sharing their results and interpretations at the meeting would inspire cross pollination of ideas from different viewpoints and lead to a more unified approach and language to understanding self-determination. The workshop format and discussions were aimed at discovering underlying principles while amplifying little known links between scientific fields. The emphasis was on discovering tools and mechanisms that have general application to research problems in biology, neuroscience, psychology, and computer science. Fifteen researchers came together to explore these issues at Harvard University, January 6-9, 1994. Together, they brought their expertise from biology, neuroscience, developmental psychology, and computational modeling. DTIC

N94-33738 New York Univ., New York, NY. Dept. of Psychology.
VISUAL MOTION PERCEPTION AND VISUAL INFORMATION PROCESSING Final Report, 1 Feb. 1991 - 31 Dec. 1993
George Sperling 31 Dec. 1993 161 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0178-91)
(AD-A278370; AFOSR-94-0159TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This final progress report summarizes the main recent results; full reports of the results are contained in the papers appended herewith. The summary also reviews some results from previous AFOSR grants where these are necessary to provide the background for the current research. Four areas are summarized: basic mechanisms of visual motion and texture perception; lateral interations in texture stimuli; information processing; and visual attention and short-term memory. DTIC

N94-33849 Boston Univ., MA. Center for Adaptive Systems.
THE COGNITIVE, PERCEPTUAL, AND NEURAL BASES OF SKILLED PERFORMANCE Final Report, 15 Mar. 1990 - 14 Mar. 1993
Stephen Grossberg Feb. 1994 88 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0175-90)
(AD-A277608; AFOSR-94-0067TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This three-year project partially supported three week-long international scientific meetings and courses on neural network research, 4 research books, more than 100 research articles, 68 Boston-area colloquia, 10 completed PhD theses, and the training of more than 20 graduate students. The research spanned a coordinated program of experimental and modeling studies of how the brain autonomously carries out intelligent behaviors in real-time in response to changing environmental contingencies. Neural models of 3-D vision and figure-around separation, motion perception, visual search, speech perception, working memories for storage of temporal sequences, supervised and unsupervised learning of recognition categories and predictions in response to nonstationary data, arm movement control, and quadruped gait transitions were developed. Technology transfers were made to processing of artificial sensor data, automatic target recognition, several industrial applications, and the control of mobile robots. DTIC

N94-33857 Boston Univ., MA.
NEURAL MODELS OF MOTION PERCEPTION Annual Technical Report, 1 Sep. 1992 - 31 Aug. 1993
Stephen Grossberg and Ennio Mingolla 22 Feb. 1994 11 p Limited Reproducibility: More than 20% of this document may be affected by

microfiche quality
(Contract F49620-92-J-0334)
(AD-A278362; AFOSR-94-0142TR) Avail: CASI HC A03

Eight research projects supported by this grant during the reporting period have resulted in three refereed publications, one under review, one book chapter, and three conference papers. Areas of research included design and simulation of neural architectures for: multichannel data fusion; object recognition and image understanding; development and refinement of algorithms for segmentation, boundary completion, and featural filling-in based on BCS/FCS architectures; network design and simulations of an architecture for breaking of unwanted persistence (hysteresis) of visual segmentations; design of a network architecture for explaining human capabilities for efficient detection of targets in clutter; design and execution of human psychophysical experiments for constraining development of the BCS; design and simulation of a network architecture for enhancing featural contrast and boundary localization at line-ends and corners through a novel circuit analog of VI to lateral geniculate nucleus feedback; and relation of hyperacuity and illusory contour data. DTIC

N94-34108 National Defence Research Establishment, Stockholm (Sweden). Huvudavdelning foer Maensklig Prestation och Funktion.
CRISIS AND DISASTER RESEARCH: A REVIEW [PROGRAMUTREDNING: KRIS- OCH KATASTROFFORSKNING]
A. Endander, G. Larsson, and C. Wallenius Nov. 1993 94 p In SWEDISH
(PB94-149234; FOA-A-50018-5.3) Avail: Issuing Activity (National Technical Information Service (NTIS))

The study focuses primarily on individual responses of relevance prior to, during, and immediately after a crisis/disaster event requiring societal or community action. The report comprises four sections: In Section 1 the need for a framework for reviewing the area of disaster research is discussed in relation to three basic problem areas. These concern: similarities and differences between different types of disaster events, the relationship between an event and the individual's subjective interpretation of the event, and finally the issue of classifying human reactions as adaptive or nonadaptive in relation to different criteria. Section 2 focuses on description and analysis of individual reactions in disaster situations. The concepts of appraisal and coping are discussed and applied to disaster situations. In Section 3 empirical studies concerning individual reactions are reviewed in relation to different societal or community responses in dealing with crises/disasters. Four main phases are discussed: prevention and general preparedness, warning and preparation for an identified threat, ways of coping in an actual crisis, and finally the recovery phase. Section 4 provides a discussion of empirical knowledge in disaster research in relation to specifically Swedish conditions. NTIS

N94-34210# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
VALIDITY OF THE AIR TRAFFIC CONTROL SPECIALIST NONRADAR SCREEN AS A PREDICTOR OF PERFORMANCE IN RADAR-BASED AIR TRAFFIC CONTROL TRAINING Final Report
Dana Broach and Carol A. Manning Apr. 1994 13 p
(DOT/FAA/AM-94/9) Avail: CASI HC A03/MF A01

Between January 1986 and March 1992, the Federal Aviation Administration's 42-day Nonradar Screen was used to identify Air Traffic Control Specialist (ATCS) candidates with the highest potential to succeed in the rigorous ATCS field training program. The central question addressed in this study was whether or not the Nonradar Screen was a valid employee selection procedure in view of the prevalence of radar in today's air traffic control system. To answer that question, we investigated the Nonradar Screen's criterion-related validity as a predictor of subsequent performance in radar-based air traffic control training. We hypothesized that the Nonradar Screen would add incremental validity over aptitude test scores in predicting performance in radar-based air traffic control (ATC) training conducted at the FAA Academy 1 to 2 years after entry into the occupation. Student aptitude test scores and Nonradar Screen final composite scores were regressed on final composite scores earned in radar-based ATC training. Results showed that Nonradar Screen composite scores had incremental validity over the written ATCS aptitude test for predicting radar-based training scores in both en route (Delta R(exp 2) = .08, F(2,438) = 36.52, p less than or equal to .001) and terminal (R(exp 2)= 10, F(2,658) = 77.66, p less than or equal to .001) radar training without correcting for range restriction due to explicit selection on the Nonradar Screen final composite score. After corrections for restriction in range, Nonradar Screen scores accounted for an additional 20 percent of variance in en route (Delta R(exp 2) = .20, F = 146.84, p less than or equal to .001) and an additional 16 percent of variance in terminal (R(exp 2) = .16, F = 178.58, p less than or equal to .001) radar training scores. These results indicated that the Nonradar Screen was a valid predictor of performance in radar-based ATC training. Similarities in nonradar and radar procedures and techniques are offered as possible explanations for the finding of criterion-related validity for the ATCS Nonradar Screen. Author

N94-33622*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AUTOGENIC-FEEDBACK TRAINING IMPROVES PILOT PERFORMANCE DURING EMERGENCY FLYING CONDITIONS
Michael A. Kellar (Tripler Army Medical Center, Honolulu, HI.), Raymond A. Folen (Tripler Army Medical Center, Honolulu, HI.), Patricia S. Cowings, William B. Toscano, and Glen L. Hisert *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 395-403 See also N93-27076 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33623*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
IMPLEMENTING BRIGHT LIGHT TREATMENT FOR MSFC PAYLOAD OPERATIONS SHIFTWORKERS Abstract Only
Benita C. Hayes, Karen T. Stewart, and Charmane I. Eastman *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 404 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33624*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
FLIGHT CONTROLLER ALERTNESS AND PERFORMANCE DURING MOD SHIFTWORK OPERATIONS
Sean M. Kelly, Mark R. Rosekind, David F. Dinges, Donna L. Miller, Kelly A. Gillen, Kevin B. Gregory, Ronald D. Aguilar, and Roy M. Smith *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 405-416 Sponsored in part by Inst. for Experimental Psychiatry Research Foundation (For primary document see N94-33612 10-99)
(Contract NCC2-599)
Avail: CASI HC A03/MF A03

N94-33625*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
AUTOMATING THE TRAINING DEVELOPMENT PROCESS FOR MISSION FLIGHT OPERATIONS
Carol J. Scott *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 417-425 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33652*# Army Research Inst. of Environmental Medicine, Natick, MA. Environmental Physiology and Medicine Directorate.
PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT WITH APPLICATION TO SPACE OPERATIONS
Kent B. Pandolf, Leander A. Stroschein, Richard R. Gonzalez, and Michael N. Sawka *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 574-581 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33654*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
LA CHALUPA-30: LESSONS LEARNED FROM A 30-DAY SUBSEA MISSION ANALOGUE
Steve VanderArk (Krug Life Sciences, Inc., Houston, TX.), JoAnna Wood (Krug Life Sciences, Inc., Houston, TX.), and Albert W. Holland *In its*

Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 584-595 (For primary document see N94-33612 10-99)
Avail: CASI HC A03/MF A03

N94-34024*# Houston Univ., TX.
SHARED VIRTUAL ENVIRONMENTS FOR AEROSPACE TRAINING Abstract Only
R. Bowen Loftin and Mark Voss *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 49 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34044*# California Univ., Irvine, CA. Department of Information and Computer Science.
FINDING ACCURATE FRONTIERS: A KNOWLEDGE-INTENSIVE APPROACH TO RELATIONAL LEARNING
Michael Pazzani and Clifford Brunk *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 187-193 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34045*# Oregon State Univ., Corvallis, OR. Dept. of Computer Science.
REINFORCEMENT LEARNING IN SCHEDULING
Tom G. Dietterich, DoKyeong Ok, Wei Zhang, and Prasad Tadepalli *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 194-199 (For primary document see N94-34019 10-99)
(Grant NAGw-1293)
Avail: CASI HC A02/MF A04

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation.*

N94-33589 Serv-Air, Inc., Lexington, KY.
INTEGRATION OF THE MOLECULAR SIEVE OXYGEN GENERATING SYSTEM (MSOGS) INTO THE UH-60Q MEDEVAC BLACKHAWK Final Report, 24 Aug. 1992 - 30 May 1993
John Hight and Orlando Cordero-Montalvo 11 Mar. 1994 54 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract MIPR-92MM2594; DA Proj. 3O4-63807-D-836)
(AD-A277668) Avail: CASI HC A04

A Molecular Sieve Oxygen Generated System (MSOGS) was integrated in the UH-60Q Medevac Helicopter as part of the requirements of this program. Support equipment for the system operation was also integrated in this effort. Problems such as intake air flow cooling and moisture build-up were addressed. Functional and performance tests were conducted by personnel from United States Army Aeromedical Research Laboratory. As a result of the integration effort a more simple and efficient method of installing the MSOGS unit and its supporting systems will be developed. Emphasis will be on the servicing of the oxygen lines on the field to make the system user friendly. DTIC

N94-33608*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AN ETHNOGRAPHIC OBJECT-ORIENTED ANALYSIS OF EXPLORER PRESENCE IN A VOLCANIC TERRAIN ENVIRONMENT: CLAIMS AND EVIDENCE
Michael W. McGreevy May 1994 57 p
(RTOP 506-59-65)
(NASA-TM-108823; A-94083; NAS 1.15:108823) Avail: CASI HC A04/MF A01

An ethnographic field study was conducted to investigate the nature of presence in field geology, and to develop specifications for domain-based planetary exploration systems utilizing virtual presence. Two planetary geologists were accompanied on a multi-day geologic field trip that they had arranged for their own scientific purposes, which centered on an investigation of the extraordinary xenolith/nodule deposits in the Kaupulehu lava flow of Hualalai Volcano, on the island of Hawaii. The geologists were observed during the course of their field investigations and interviewed regarding their activities and ideas. Analysis of the interview resulted in the identification of key domain entities and their attributes, relations among the entities, and explorer interactions with the environment. The results support and extend the author's previously reported continuity theory of presence, indicating that presence in field geology is characterized by persistent engagement with objects associated by metonymic relations. The results also provide design specifications for virtual planetary exploration systems, including an integrating structure for disparate data integration. Finally, the results suggest that unobtrusive participant observation coupled with field interviews is an effective research methodology for engineering ethnography. Author

N94-33707 Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
EFFECTS OF HEAT ACCLIMATION ON HEAT-EXERCISE TOLERANCE IN UNTRAINED AND ENDURANCE-TRAINED MEN WEARING NBC PROTECTIVE CLOTHING
Yukitoshi Aoyagi, Tom M. McLellan, and Roy J. Shephard Aug. 1993 37 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277522; DCIEM-93-47) Avail: CASI HC A03

Responses were compared between nine untrained (UT) men and six men who had participated in 8 weeks of endurance training (ET). Both groups underwent 6 days of heat acclimation in a climatic chamber that was maintained at 40 +/- 0.5 C and 30 +/- 1% rh. Subjects were tested before and after acclimation wearing either standard military combat clothing or nuclear, biological and/or chemical (NBC) protective clothing. Test sessions involved treadmill walking at 4.8 km/h and 2% grade for a maximum of 120 min. In UT subjects, heat acclimation increased plasma volume (+8 +/- 2%), but VO sub 2max and heat-exercise tolerance time were unchanged. When wearing standard combat clothing, acclimation decreased average values of heart rate, rectal temperature (T sub re), mean skin temperature (T sub sk), thermal discomfort, and metabolic heat production. When wearing NBC protective clothing, the only significant change was in T sub re. Acclimation induced an increase of sweat secretion but no statistically significant increase of sweat evaporation in NBC protective clothing. In ET subjects, acclimation reduced thermal discomfort when wearing standard combat clothing, and T sub re and T sub sk when wearing NBC protective clothing. The results suggest that heat acclimation did little to improve exercise tolerance when wearing NBC protective clothing in hot environments, although it reduced thermoregulatory strain by lowering mean body temperature, irrespective of training status. DTIC

N94-33781 Department of the Navy, Washington, DC.
ADVANCED EYE OR SENSOR PROTECTION AND HIGH SPEED VARIABLE OPTICAL ATTENUATION SYSTEM Patent
William B. Cushman, inventor (to Navy) 19 Oct. 1993 5 p Filed 14 Feb. 1992
(AD-D016150; US-Patent-5,255,117; US-Patent-Appl-SN-842287; US-Patent-Class-359-234) Avail: US Patent and Trademark Office

In order to protect the eyes or other sensor, from light produced, e.g., by modern laser weapons which have extremely fast onset times and high power per pulse, a protective shutter device is provided which is based on the integrative property of such sensors. The sensor is shielded for a large proportion of the time and only exposed after a light detector associated with the protective device has assured a safe environment. The normal exposure provided is a series of rapid image-views that integrate over time within the sensor. In an eye goggles embodiment, clear vision is maintained and a fast-response variable-density 'sunglass' is perceived by the wearer. Only one eye is exposed and thus at risk at any one time, and that eye only about 10% of the total time. A high-speed mechanical shutter controls the exposure experienced by the sensor. DTIC

N94-33957*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

EVALUATION OF LENS DISTORTION ERRORS USING AN UNDERWATER CAMERA SYSTEM FOR VIDEO-BASED MOTION ANALYSIS

Jeffrey Poliner (Lockheed Engineering and Sciences Co., Houston, TX.), Lauren Fletcher, and Glenn K. Klute Jun. 1994 19 p

(NASA-TM-104795; S-769; NAS 1.15:104795) Avail: CASI HC A03/MF A01

Video-based motion analysis systems are widely employed to study human movement, using computers to capture, store, process, and analyze video data. This data can be collected in any environment where cameras can be located. One of the NASA facilities where human performance research is conducted is the Weightless Environment Training Facility (WETF), a pool of water which simulates zero-gravity with neutral buoyance. Underwater video collection in the WETF poses some unique problems. This project evaluates the error caused by the lens distortion of the WETF cameras. A grid of points of known dimensions was constructed and videotaped using a video vault underwater system. Recorded images were played back on a VCR and a personal computer grabbed and stored the images on disk. These images were then digitized to give calculated coordinates for the grid points. Errors were calculated as the distance from the known coordinates of the points to the calculated coordinates. It was demonstrated that errors from lens distortion could be as high as 8 percent. By avoiding the outermost regions of a wide-angle lens, the error can be kept smaller. Author

N94-33973*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

TRACE CONTAMINANT CONTROL SIMULATION COMPUTER PROGRAM, VERSION 8.1

J. L. Perry May 1994 126 p

(NASA-TM-108457; NAS 1.15:108457) Avail: CASI HC A07/MF A02

The Trace Contaminant Control Simulation computer program is a tool for assessing the performance of various process technologies for removing trace chemical contamination from a spacecraft cabin atmosphere. Included in the simulation are chemical and physical adsorption by activated charcoal, chemical adsorption by lithium hydroxide, absorption by humidity condensate, and low- and high-temperature catalytic oxidation. Means are provided for simulating regenerable as well as nonregenerable systems. The program provides an overall mass balance of chemical contaminants in a spacecraft cabin given specified generation rates. Removal rates are based on device flow rates specified by the user and calculated removal efficiencies based on cabin concentration and removal technology experimental data. Versions 1.0 through 8.0 are documented in NASA TM-108409. TM-108409 also contains a source file listing for version 8.0. Changes to version 8.0 are documented in this technical memorandum and a source file listing for the modified version, version 8.1, is provided. Detailed descriptions for the computer program subprograms are extracted from TM-108409 and modified as necessary to reflect version 8.1. Version 8.1 supersedes version 8.0. Information on a separate user's guide is available from the author.

Author

N94-34389# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

THE EFFECTS OF COLD EXPOSURE ON WET AIRCRAFT PASSENGERS: A REVIEW Final Report

Robert P. Garner, Bruce C. Wilcox, Harvey M. England, and Van B. Nakagawara May 1994 12 p

(DOT/FAA/AM-94/10) Avail: CASI HC A03/MF A01

The incorporation of a cabin water spray system (CWSS) aboard commercial passenger aircraft has been suggested as a mechanism of reducing passenger death and injury from the fire and smoke commonly associated with aircraft accidents. A potential health risk associated with a CWSS is the physiological stress that would be imposed upon an individual by being wet from a CWSS in the aircraft cabin and then evacuated into a cold environment. The severity of this type of exposure would be proportional to the degree to which the individual was doused with water and the wind speed and inversely proportionally to the ambient temperature. The physiological responses to partial wetting and subsequent exposure to cold environmental conditions have not been studied. The effects of cold exposure as well as the degree of protection provided to the individual, particularly the cardiorespiratory system, by CWSS would need to be fully investigated to determine if the survival benefits of a CWSS outweigh the potential health risks. Author

N94-34706*# Sterling Software, Inc., Palo Alto, CA.

MAN-MACHINE INTEGRATION DESIGN AND ANALYSIS SYSTEM (MIDAS) TASK LOADING MODEL (TLM) EXPERIMENTAL AND SOFTWARE DETAILED DESIGN REPORT

Lowell Staveland May 1994 75 p Sponsored in cooperation with USAATCOM

(Contract NAS2-13210)

(NASA-CR-177640; A-94080; NAS 1.26:177640; USAATCOM-TR-94-A-012) Avail: CASI HC A04/MF A01

This is the experimental and software detailed design report for the prototype task loading model (TLM) developed as part of the man-machine integration design and analysis system (MIDAS), as implemented and tested in phase 6 of the Army-NASA Aircrew/Aircraft Integration (A3I) Program. The A3I program is an exploratory development effort to advance the capabilities and use of computational representations of human performance and behavior in the design, synthesis, and analysis of manned systems. The MIDAS TLM computationally models the demands designs impose on operators to aide engineers in the conceptual design of aircraft crewstations. This report describes TLM and the results of a series of experiments which were run this phase to test its capabilities as a predictive task demand modeling tool. Specifically, it includes discussions of: the inputs and outputs of TLM, the theories underlying it, the results of the test experiments, the use of the TLM as both stand alone tool and part of a complete human operator simulation, and a brief introduction to the TLM software design. Derived from text

N94-35115* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

PROSTHETIC ELBOW JOINT Patent

Bruce C. Weddendorf, inventor (to NASA) 24 May 1994 9 p Filed 8 Jul. 1992 Supersedes N93-30566 (31 - 11, p 3508)

(NASA-Case-MFS-28707-1; US-Patent-5,314,500;

US-Patent-Appl-SN-912953; US-Patent-Class-623-57;

US-Patent-Class-623-59; US-Patent-Class-623-60;

Int-Patent-Class-A61F-2/66; Int-Patent-Class-A61F-2/54;

Int-Patent-Class-A61F-2/58) Avail: US Patent and Trademark Office

An artificial, manually positionable elbow joint for use in an upper extremity, above-elbow, prosthetic is described. The prosthesis provides a locking feature that is easily controlled by the wearer. The instant elbow joint is very strong and durable enough to withstand the repeated heavy loadings encountered by a wearer who works in an industrial, construction, farming, or similar environment. The elbow joint of the present invention comprises a turntable, a frame, a forearm, and a locking assembly. The frame generally includes a housing for the locking assembly and two protruding ears. The forearm includes an elongated beam having a cup-shaped cylindrical member at one end and a locking wheel having a plurality of holes along a circular arc on its other end with a central bore for pivotal attachment to the protruding ears of the frame. The locking assembly includes a collar having a central opening with a plurality of internal grooves, a plurality of internal cam members each having a chamfered surface at one end and a V-shaped slot at its other end; an elongated locking pin having a crown wheel with cam surfaces and locking lugs secured thereto; two coiled compression springs; and a flexible filament attached to one end of the elongated locking pin and extending from the locking assembly for extending and retracting the locking pin into the holes in the locking wheel to permit selective adjustment of the forearm relative to the frame. In use, the turntable is affixed to the upper arm part of the prosthetic in the conventional manner, and the cup-shaped cylindrical member on one end of the forearm is affixed to the forearm piece of the prosthetic in the conventional manner. The elbow joint is easily adjusted and locked between maximum flex and extended positions.

Official Gazette of the U.S. Patent and Trademark Office

N94-33613*# Brookhaven National Lab., Upton, NY. Human Factors and Performance Analysis Group.

HFE SAFETY REVIEWS OF ADVANCED NUCLEAR POWER PLANT CONTROL ROOMS

John OHara *In* NASA. Johnson Space Center, Seventh Annual Workshop

on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 329-336 Sponsored by Nuclear Regulatory Commission (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33619*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.
FUSION INTERFACES FOR TACTICAL ENVIRONMENTS: AN APPLICATION OF VIRTUAL REALITY TECHNOLOGY
Michael W. Haas *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 378-387 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33620*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
VIRTUAL REALITY AS A HUMAN FACTORS DESIGN ANALYSIS TOOL: MACRO-ERGONOMIC APPLICATION VALIDATION AND ASSESSMENT OF THE SPACE STATION FREEDOM PAYLOAD CONTROL AREA Abstract Only
Joseph P. Hale *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 388 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33621*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A RAPID ALGORITHM FOR REALISTIC HUMAN REACHING AND ITS USE IN A VIRTUAL REALITY SYSTEM
Ann Aldridge (Lockheed Engineering and Sciences Co., Houston, TX.), Abhilash Pandya (Lockheed Engineering and Sciences Co., Houston, TX.), Michael Goldsby (Lockheed Engineering and Sciences Co., Houston, TX.), and James Maida *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 389-394 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33627*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TASK NETWORK MODELS IN THE PREDICTION OF WORKLOAD IMPOSED BY EXTRAVEHICULAR ACTIVITIES DURING THE HUBBLE SPACE TELESCOPE SERVICING MISSION
Manuel F. Diaz (Lockheed Engineering and Sciences Co., Houston, TX.), Neal Takamoto (Air Force Systems Command, Brooks AFB, TX.), and Barbara Woolford *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 432-436 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33628*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
A HUMAN FACTORS EVALUATION USING TOOLS FOR AUTOMATED KNOWLEDGE ENGINEERING
Marie E. Gomes and Stephanie Lind *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 437-441 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33629*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN OVERVIEW OF SPACE SHUTTLE ANTHROPOMETRY AND BIOMECHANICS RESEARCH WITH EMPHASIS ON STS/MIR RECUMBENT SEAT SYSTEM DESIGN
Glenn K. Klute and Lara E. Stoycos *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 442-446 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33630*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.
ANTHROPOMETRIC ACCOMMODATION IN USAF COCKPITS
Gregory F. Zehner *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 447-459 (For primary document see N94-33612 10-99)
Avail: CASI HC A03/MF A03

N94-33634*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A COMPARISON OF PAPER AND COMPUTER PROCEDURES IN A SHUTTLE FLIGHT ENVIRONMENT
Michael ONeal (Lockheed Engineering and Sciences Co., Houston, TX.), Kritina Holden (Lockheed Engineering and Sciences Co., Houston, TX.), Steve Wolf (Lockheed Engineering and Sciences Co., Houston, TX.), and Frances Mount *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 483-491 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33635*# Aerospace Medical Research Labs., Brooks AFB, TX.
GRAVITY, THE THIRD DIMENSION OF LIFE SUPPORT IN SPACE Abstract Only
Russell R. Burton *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 493 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33636*# Naval Air Warfare Center, Warminster, PA.
THE US NAVY/CANADIAN DCIEM RESEARCH INITIATIVE ON PRESSURE BREATHING PHYSIOLOGY Abstract Only
Phillip E. Whitley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 494 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33642*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TOTAL HYDROCARBON ANALYSIS BY ION MOBILITY SPECTROMETRY
John H. Cross (Krug Life Sciences, Inc., Houston, TX.), Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.), and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 522-531 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33649*# Aerospace Medical Research Labs., Brooks AFB, TX.
PERSONAL COOLING SYSTEMS: POSSIBILITIES AND LIMITATIONS Abstract Only
Sarah A. Nunneley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 559 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33650*# Army Research Inst. of Environmental Medicine, Natick, MA. Biophysics and Biomedical Modeling Div.
MODELING HEAT EXCHANGE CHARACTERISTICS OF LONG TERM SPACE OPERATIONS: ROLE OF SKIN WETTEDNESS AND EXERCISE
Richard R. Gonzalez *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 560-566 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33653*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EVALUATION OF A LIQUID COOLING GARMENT AS A COMPONENT OF THE LAUNCH AND ENTRY SUIT (LES) Abstract Only
J. Waligora, J. Charles, I. Fritsch, S. Fortney, S. Siconolfi, L. Pepper, L. Bagian, and V. Kumar *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 583 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33655*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COMPARATIVE PERFORMANCE OF A MODIFIED SPACE SHUTTLE REENTRY ANTI-G SUIT (REAGS) WITH AND WITHOUT PRESSURE SOCKS Abstract Only
R. W. Krutz, Jr. (Krug Life Sciences, Inc., Houston, TX.), G. L. Ripley (Krug Life Sciences, Inc., Houston, TX.), J. A. Marshall (Aerospace Medical Research Labs., Brooks AFB, TX.), and C. F. Sawin *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 596 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33656*# Aerospace Medical Research Labs., Brooks AFB, TX.
CURRENT AND FUTURE ISSUES IN USAF FULL PRESSURE SUIT RESEARCH AND DEVELOPMENT Abstract Only
Terrell E. Scoggins *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 597 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33657*# Naval Air Warfare Center, Warminster, PA.
ADVANCED INTEGRATED LIFE SUPPORT SYSTEM UPDATE Abstract Only
Phillip E. Whitley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 598 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33659*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CHARACTERIZATION OF SPACECRAFT HUMIDITY CONDENSATE Abstract Only
Susan Muckle (Krug Life Sciences, Inc., Houston, TX.), John R. Schultz (Krug Life Sciences, Inc., Houston, TX.), and Richard L. Sauer *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 600 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33660*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COMPUTATION OF IODINE SPECIES CONCENTRATIONS IN WATER Abstract Only
John R. Schultz (Krug Life Sciences, Inc., Houston, TX.), Paul D. Mudgett (Krug Life Sciences, Inc., Houston, TX.), David T. Flanagan (Krug Life Sciences, Inc., Houston, TX.), and Richard L. Sauer *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 601 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33661*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A VOLATILE ORGANIC ANALYZER FOR SPACE STATION: DESCRIPTION AND EVALUATION OF A GAS CHROMATOGRAPHY/ION MOBILITY Abstract Only
Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.) and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 602 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33662*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SAFETY CONCERNS FOR FIRST ENTRY OPERATIONS OF ORBITING SPACECRAFT Abstract Only
Steven H. Wilson (Krug Life Sciences, Inc., Houston, TX.), Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.), and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 603 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-33663*# McDonnell Aircraft Co., Saint Louis, MO.
UNIQUE METHODS FOR ON-ORBIT STRUCTURAL REPAIR, MAINTENANCE, AND ASSEMBLY
Ray Anderson and Phil Fuson *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 605-610 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34035*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
EVA-SCRAM OPERATIONS
Lee A. Flanigan (Rockwell International Corp., Huntsville, AL.), David Tamir (Rockwell International Corp., Cocoa Beach, FL.), Jack L. Weeks (Rockwell International Corp., Huntsville, AL.), Sidney R. McClure, and Andrew G. Kimbrough *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 121-129 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34627# Sikorsky Aircraft, Stratford, CT. Crew Station Design.
EXPANDING THE PILOT'S ENVELOPE
Bruce E. Hamilton *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 6 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N94-34951*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
US EXPERIMENT FLOWN ON THE SOVIET BIOSATELLITE COSMOS 1667 Final Report
John W. Hines, ed. and Michael G. Skidmore, ed. May 1994 133 p (RTOP 199-70-12)
(NASA-TM-108803; A-94032; NAS 1.15:108803) Avail: CASI HC A07/MF A02

Two male young-adult rhesus monkeys were flown on the Soviet Biosatellite Cosmos 1667 for seven days from July 10-17, 1985. Both animals were instrumented to record neurophysiological parameters. One animal, Gordyy, was additionally instrumented to record cardiovascular changes. Space capsule and environmental parameters were very similar to those of previous missions. On Cosmos 1514, which flew for five days in 1983, one animal was fitted with a left carotid artery cuff to measure blood pressure and flow velocity. An additional feature of Cosmos 1667 was a postflight control study using the flight animal. Intermittent postural tilt tests were also conducted before and after spaceflight and synchronous control studies, to simulate the fluid shifts associated with spaceflight. The experiment results support the conclusion derived from Cosmos 1514 that significant cardiovascular changes occur with spaceflight. The changes most clearly seen were rapid initial decreases in heart rate and further decreases with continued exposure to microgravity. The triggering mechanism appeared to be a headward shift in blood and tissue fluid volume which, in turn,

triggered adaptive cardiovascular changes. Adaptive changes took place rapidly and began to stabilize after the first two days of flight. However, these changes did not plateau in the animal by the last day of the mission. Author

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N94-34918*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
ANALYSIS OF OPTIMISTIC WINDOW-BASED SYNCHRONIZATION Final Report
Phillip M. Dickens, David M. Nicol, Paul F. Reynolds, Jr., and J. M. Duva Apr. 1994 24 p Submitted for publication
(Contract NAS1-19480; NSF CCR-92-01195; RTOP 505-90-52-01)
(NASA-CR-194906; NAS 1.26:194906; ICASE-94-27) Avail: CASI HC A03/MF A01

This paper studies an analytic model of parallel discrete-event simulation, comparing the costs and benefits of extending optimistic processing to the YAWNS synchronization protocol. The basic model makes standard assumptions about workload and routing; we develop methods for computing performance as a function of the degree of optimism allowed, overhead costs of state-saving, rollback, and barrier synchronization, and logical process (LP) aggregation. This allows an approximation-based analysis of the range of situations under which optimism is a beneficial extension to YAWNS. We find that limited optimism is beneficial if the processor load is sparse, but that aggregating LP's onto processors improves YAWNS relative performance. Author (revised)

60 COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering.*

N94-33402# Corticon, Inc., Philadelphia, PA.
ASSEMBLY OF A NEURAL ANALOG COMPUTER, PHASE 2 Final Report
Feb. 1994 32 p
(Contract N00014-91-C-0204)
(AD-A278192) Avail: CASI HC A03/MF A01

The aims of this project were the design and construction of a programmable analog neural computer. The development of the neural computer was motivated by the need for the unprecedented computational power required to solve real world problems in real time. Seemingly simple tasks such as seeing, hearing, and motion, easily performed by any animal, have proved to be beyond reach for even the most advanced computers. Although many of the computational principles and algorithms used by biological brains are now understood, simulations of neural networks on digital machines have shown that such machines cannot provide the necessary speed. DTIC

N94-33852 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
FORMAL CONNECTORS
Robert Allen and David Garlan Mar. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33615-93-1-1330; NSF CCR-93-57792)
(AD-A277611; CMU-CS-94-115) Avail: CASI HC A03

As software systems become more complex the overall system structure - or software architecture - becomes a central design problem. An important step towards an engineering discipline of software is a formal basis for describing and analyzing these designs. In this paper we present a theory for one aspect of architectural description: the interactions between components. The key idea is to define architectural connectors as explicit semantic entities. These are specified as a collection of protocols that characterize each of the participant roles in an interaction and how these roles interact. We illustrate how this scheme can be used to define a variety of common architectural connectors. We further provide a formal semantics and show how this leads to a system in which architectural compatibility can be checked in a way analogous to type checking in programming languages. DTIC

N94-34083# Franco-Polish School of New Information and Communication Technology, Poznan (Poland).
PROCEEDINGS SAFECOMP 1993: THE 12TH INTERNATIONAL CONFERENCE ON COMPUTER SAFETY, RELIABILITY AND SECURITY
Janusz Gorski 29 Oct. 1993 404 p Conference held in Poznan-Kiekrz, Poland, 27-29 Oct. 1993
(AD-A278165; R/D-6993-CC-02) Avail: CASI HC A18/MF A04

The safe operation of computer systems continues to be a key issue in many applications where people, environment, investment, or goodwill can be at risk. Such applications include medical, railways, power generation and distribution, road transportation, aerospace, process industries, mining, military, and many others. This book represents the proceedings of the 12th International Conference on Computer Safety, Reliability, and Security, held in Poznan, Poland, 27-29 October 1993. The conference reviews the state of the art, experiences, and new trends in the areas of computer safety, reliability, and security. It forms a platform for technology transfer between academia, industry, and research institutions. In an expanding world-wide market for safe, secure, and reliable computer systems, SAFECOMP '93 provides an opportunity for technical developers, users, and legislators to exchange and review the experience, to consider the best technologies now available, and to identify the skills and technologies required for the future. DTIC

N94-34129# Technische Univ., Twente (Netherlands). Dept. of Computer Science.
OVERVIEW OF PH.D. THESES AND MEMORANDA, 1992 (UNIVERSITY OF TWENTE, DEPARTMENT OF COMPUTER SCIENCE)
1993 53 p See also PB93-110369
(PB94-149598; Memo-INF-93-01) Copyright Avail: CASI HC A04/MF A01

This memorandum gives an overview of the PhD theses and technical reports of 1992 published by members of the Department of Computer Science of the University of Twente. NTIS

N94-34373# Los Alamos National Lab., NM.
HIPPI, FIBRE CHANNEL, AND ATM AS GIGABIT/S LAN'S
D. Tolmie 1993 7 p Presented at the Networld + Interop 1994 Engineer's Conference, Las Vegas, NV, 2-6 May 1994
(Contract W-7405-eng-36)
(DE94-005089; LA-UR-93-4438; CONF-940571-1) Avail: CASI HC A02/MF A01

Computer networks that operate in the gigabit per second speed range are becoming very important for interconnecting supercomputers and other high end equipment. Some trends and applications are examined and criteria for selecting an interconnection technology are developed. HIPPI is the current interface of choice, while Fibre Channel and ATM are emerging standards. These systems are examined as to their backgrounds, advantages, and shortcomings. DOE

N94-34943*# Illinois Univ., Urbana-Champaign, IL. Coordinated Science Lab.
AUTOMATIC GENERATION OF EFFICIENT ARRAY REDISTRIBUTION ROUTINES FOR DISTRIBUTED MEMORY MULTICOMPUTERS
Shankar Ramaswamy and Prithviraj Banerjee 8 Apr. 1994 28 p
(Contract NAG1-613; N00014-91-J-1096)
(NASA-CR-195963; NAS 1.26:195963; UILU-ENG-94-2213; CRHC-94-09) Avail: CASI HC A03/MF A01

Appropriate data distribution has been found to be critical for obtaining good performance on Distributed Memory Multicomputers like the CM-5, Intel Paragon and IBM SP-1. It has also been found that some programs need to change their distributions during execution for better performance (redistribution). This work focuses on automatically generating efficient routines for redistribution. We present a new mathematical representation for regular distributions called PITFALLS and then discuss algorithms for redistribution based on this representation. One of the significant contributions of this work is being able to handle arbitrary source and

target processor sets while performing redistribution. Another important contribution is the ability to handle an arbitrary number of dimensions for the array involved in the redistribution in a scalable manner. Our implementation of these techniques is based on an MPI-like communication library. The results presented show the low overheads for our redistribution algorithm as compared to naive runtime methods. Author

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, alogorithms, and specific applications, e.g., CAD/CAM.

N94-33374# Virginia Univ., Charlottesville, VA. School of Engineering and Applied Science.
THE STARLITE PROJECT: PROTOTYPING REAL-TIME SOFTWARE Final Report, 1 Oct. 1991 - 31 Jul. 1993
Snag H. Son and R. P. Cook Apr. 1994 16 p
(Contract N00014-91-J-1102)
(AD-A278201; UVA/525449/CS94/103) Avail: CASI HC A03/MF A01

The StarLite Project has the goal of discovering a set of design principles and developing efficient algorithms for distributed real-time systems. The focus of the project is on scheduling algorithms and database systems. The project also involves the construction of a prototyping environment that supports experimentation with concurrent and distributed/parallel algorithms for performance testing. One of the most important achievements in this project is the development of new scheduling algorithms based on the idea of adjusting the serialization order of active transactions dynamically. When compared with conventional transaction scheduling algorithms, our algorithms significantly improve the percentage of high priority transactions that meet the deadline. In addition, we have developed experimental database systems for performance evaluation of new technology. The RTDB server on ARTS kernel is extended to support application programmatic interface, graphic user interface, imprecise computing server, indexing mechanisms, and distributed multiple server. DTIC

N94-33377# Georgia Inst. of Tech., Atlanta, GA. Coll. of Computing.
A CASE-BASED APPROACH TO CREATIVE DESIGN Annual Report
Janet L. Kolodner and Ashok Goel Jan. 1994 16 p
(Contract N00014-92-J-1234)
(AD-A278235) Avail: CASI HC A03/MF A01

We are studying and modeling creative design processes. Our goals are two-fold. One is to make intelligent, computer-based design assistants more creative (e.g., able to suggest unusual but useful solutions and to bring up important issues that might not have been considered otherwise). The other is to build computational models that help us understand human creativity. This will have implications for design education and suggest ways of enhancing the creativity of human designers. To gain insights into the knowledge and reasoning involved in creative design, we performed an exploratory study of student mechanical engineers engaged in a seven-week undergraduate design project. In this study, we observed a great deal of the design process, including informal team meetings (e.g., while choosing materials at a store) as well as official meetings. This has given us insights into the processes underlying many creative design activities, particularly the following: how designers generate multiple alternative views of a problem through situation assessment and reformulation; how problem constraints, evaluation criteria, and preferences gradually emerge or become refined as ideas are proposed and critiqued; and how designers serendipitously recognize solutions to pending problems, often seeing new functions and purposes for common design pieces in the process. DTIC

N94-33379# George Mason Univ., Fairfax, VA.
SOLUTION PROCEDURES FOR LARGE-SCALE COMBINATORIAL OPTIMIZATION Final Report, 1 Mar. 1990 - 31 Aug. 1993
Karla L. Hoffman 31 Aug. 1993 7 p
(Contract F49620-90-C-0022)
(AD-A278242; AFOSR-94-0209TR) Avail: CASI HC A02/MF A01

Results of research performed under this grant have shown that problems having thousands, and sometimes millions, of variables can be solved using present-day technology based on mathematical results that utilize the structure underlying the problem and that incorporate related advances of the mathematical theory into a general approach called 'branch-and-cut'. The term 'branch-and-cut' and the ideas encompassing it, are the direct result of this research effort. Now the two leading commercial codes for solving integer programming problems, OSL and CpleX both incorporate cutting plane ideas and use the term 'branch-and-cut' in their marketing literature. DTIC

N94-33394 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
PURSUIT: VISUAL PROGRAMMING IN A VISUAL DOMAIN
Francesmary Modugno and Brad A. Myers Jan. 1994 26 p Sponsored in part by Hertz Foundation and AAUW Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant NSF IRI-90-20089)
(AD-A277567; CMU-CS-94-109) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

We present a new visual programming language and environment that serves as a form of feedback and representation in a programming by demonstration system. The language differs from existing visual languages because it explicitly represents data objects and implicitly represents operations by changes in data objects. The system was designed to provide nonprogrammers with programming support for common, repetitive tasks and incorporates some principles of cognition to assist these users in learning to use it. With this in mind, we analyze the language and its editor along cognitive dimensions. The assessment provides insight into both strengths and weaknesses of the system, suggesting a number of design changes. DTIC

N94-33427 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
Iwmeter: A REAL-TIME AND INTERACTIVE PARALLEL SOFTWARE MONITOR FOR iWarp
Ming-Jen Chan and Eka N. Ginting 18 Feb. 1994 19 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00039-93-C-0152)
(AD-A277587; CMU-CS-94-117) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Performance measurement and monitoring tools are indispensable for research and application developments on a parallel system. To be effective, such tools must be accurate, nonintrusive, efficient. and easy to understand. Private-memory MIMD machines present special challenges, especially due to the amount of data that must be gathered and analyzed, as well as the communication support required to manage these data. This paper describes the iwmeter, a real-time and interactive parallel software monitor for MFLOPS performance. Implemented for the iWarp system, a private-memory multicomputer, the iwmeter is composed of three independent units: the sampling, units. the collection unit, and the reporting unit. Each sampling unit samples the user's program in each processor in a random fashion. The collection unit collects the data gathered by each individual sampling unit, and the reporting unit processes and reports the data to the user. We conclude the paper with an evaluation of the iwmeter's accuracy. DTIC

N94-33602 Naval Postgraduate School, Monterey, CA.
A SIMPLE, LOW OVERHEAD DATA COMPRESSION ALGORITHM FOR CONVERTING LOSSY COMPRESSION PROCESSES TO LOSSLESS M.S. Thesis
Walter D. Abbott, III Dec. 1993 93 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277905) Avail: CASI HC A05

In this thesis, a hybrid lossless compression model is tested which employs a combination of both a lossy compression method and one or more lossless image compression methods to produce an overall lossless image compression. The hybrid model decomposes the original image into a browse and a residual image. The hybrid model is tested and evaluated using various combinations of lossy and lossless image compression methods. The lossy compression method used in the model is JPEG

(Joint Photographic Experts Group). The lossless compression methods used are Huffman, arithmetic, LZW, lossless JPEG, and diagonal coding. The compression results achieved using the hybrid compression model are compared to the compression achieved using the corresponding direct lossless compression. Additionally, the hybrid model is evaluated as to the advantages that the decomposition of the image into browse and residual images provide to the user. DTIC

N94-33675 University of Southern California, Los Angeles, CA. Inst. for Robotics and Intelligent Systems.

RESEARCH IN IMAGE UNDERSTANDING Final Technical Report, 1 Sep. 1990 - 31 Sep. 1994

Ramakant Nevatia 11 Jan. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F49620-90-C-0078)

(AD-A278540; IRIS-92-320; AFOSR-94-0248TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

We undertook a broad program for research into image understanding techniques suited for a variety of applications. We divided our tasks into three major categories. However, we wish to emphasize that the different tasks are highly interrelated and share many common techniques. The major task areas over the course of this contract were three-dimensional vision including descriptions from range data, shape inference from images, and object recognition, motion analysis and parallel processing. This report discusses the status of the various individual research projects funded by this contract. DTIC

N94-33713# Los Alamos National Lab., NM.

DATA VISUALIZATION FOR ONEDANT AND TWODANT DISCRETE ORDINATES CODES

C. L. Lee (Florida Univ., Gainesville, FL.) and R. T. Perry 1993 3 p Presented at the 11th Topical Meeting on the Technology of Fusion Energy, New Orleans, LA, 19-24 Jun. 1994

(Contract W-7405-eng-36)

(DE94-005087; LA-UR-93-4454; CONF-940630-1) Avail: CASI HC A01/MF A01

Effective graphical display of code calculations allow for efficient analysis of results. This is especially true in the case of discrete ordinates transport codes, which can generate thousands of flux or reaction rate data points per calculation. For this reason, a package of portable interface programs called OTTUI (ONEDANT-TWODANT-Tecplot(trademark) Unix-Based Interface) has been developed at Los Alamos National Laboratory to permit rapid visualization of ONEDANT and TWODANT discrete ordinates results using the graphics package Tecplot. This paper describes the various uses of OTTUI for display of ONEDANT and TWODANT problem geometries and calculational results. DOE

N94-33742 California Inst. of Tech., Pasadena, CA. Dept. of Computer Science.

PROGRAM COMPOSITION Final Report, 1 Nov. 1990 - 31 Oct. 1993

K. Chandy 31 Jan. 1994 6 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Grant AF-AFOSR-0070-91)

(AD-A278377; AFOSR-94-0168TR) Avail: CASI HC A02

Work done under this grant falls under four main areas: theory of concurrent systems - has led to much simpler ways of demonstrating the correctness of concurrent programs; use of Ada in parallel programming - exploring simple extensions of Ada that would make it suitable for shared-memory multiprocessor machines; parallel paradigm integration - researchers developed software and methods that help in developing large parallel applications incorporating both functional and data parallelism; and language development - this grant initiated work on PCN (program composition notation), a very simple language for composing programs in Fortran and C. PCN has been ftp'd at over 300 sites, including Air Force laboratories, and is being used at several universities for teaching parallel programming. DTIC

N94-33784 Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

EFFECTIVE PARALLEL ALGORITHM ANIMATION M.S. Thesis

Paul W. Chase Mar. 1994 208 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A278552; AFIT/GE/ENG/94M-04) Avail: CASI HC A10

The AFIT Algorithm Animation Research Facility (AAARF) was developed by the Air Force Institute of Technology (AFIT) as a teaching aid for data structures and algorithm design. In particular, an extensive set of performance animations has been developed for the Intel iPSC Hypercube parallel processing system. This research focuses in part on developing animation support for discrete event simulation, mission routing, and evolutionary algorithms based on abstract representations of parallel algorithm behavior. The effort also builds extensions to the AAARF system and examines direction for further research. An innovative adaptable application-specific animation construction environment has been designed and implemented. The environment provides a set of composible graphics objects and a flexible event mapping and transformation system that allows development of arbitrary animation formats. The system also reduces operational complexity via a simplified event format. The resulting visualization system is inherently portable between architectures, easily extensible to meet specific user animation requirements, and successfully deals with scalability problems associated with massively parallel processing systems. DTIC

N94-33787 Sparta, Inc., Lexington, MA.

USERS GUIDE FOR SENTRAN7, VERSION 2.0

David R. Longtin and John R. Hummel 20 Aug. 1993 148 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract F19628-91-C-0093)

(AD-A278562; LTR93-013; PL-TR-93-2197; AD-E201848; SR-6) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

SENTRAN7 is a user friendly interface system to LOWTRAN7 and MODTRAN. The code permits users to rapidly evaluate atmospheric conditions and path geometries. The main features of SENTRAN7 include: (1) interactive entry of LOWTRAN7/MODTRAN input parameters and directives for their perturbation, (2) intelligent generation of LOWTRAN7/MODTRAN input deck images, (3) autonomous post-processing of LOWTRAN7/MODTRAN outputs for data extraction, analysis and 3D graphical display, and (4) a help utility. The thrust of the current effort is to incorporate new features and enhancements into SENTRAN7. The new code is called SENTRAN7, Version 2.0. The new features include: (1) the capability to impose random and percent perturbations by layer on user-defined profiles of atmospheric constituents, (2) a comprehensive error checking package that checks user-defined profiles of atmospheric constituents, (3) an option to save LOWTRAN/MODTRAN output as customized file names, and (4) a general purpose module that permits users to view the contents of files of their choosing. DTIC

N94-33830# Massachusetts Univ., Amherst, MA.

PREDICTABLE AND ADAPTABLE COMPLEX REAL-TIME SYSTEMS Report, 1 Oct. 1991 - 30 Sep. 1993

Krithi Ramamritham and John A. Stankovic 30 Sep. 1993 17 p

(Contract N00014-92-J-1048)

(AD-A277827) Avail: CASI HC A03/MF A01

Our investigations covered many aspects of real-time system research and development with special emphasis on scheduling algorithm development, evaluation, and realization. Results were also obtained in real-time operating systems, fault-tolerance, software tools, hardware/software integration, and real-time databases. We have also attempted to test the concepts and technologies developed by incorporating them in a flexible manufacturing testbed. DTIC

N94-33843# Lawrence Livermore National Lab., CA.

A NEW AUTOMATIC CONTACT FORMULATION IN DYNA3D

R. G. Whirley and B. E. Engelmann Aug. 1993 13 p Presented at the DYNA3D Users Group Conference, Notingham, England, 28-29 Sep. 1993

(Contract W-7405-eng-48)

(DE94-008299; UCRL-JC-115204; CONF-9309353-1) Avail: CASI HC A03/MF A01

This paper presents a new approach for the automatic definition and treatment of mechanical contact in DYNA3D. Automatic contact offers the benefits of significantly reduced model construction time and fewer opportunities for user error, but must maintain high reliability and acceptable computational costs. The major features of the proposed new method

include automatic identification of potentially contacting surfaces during the initialization phase, a new high-performance contact search procedure, and the use of a well-defined surface normal which allows a consistent treatment of shell intersection and corner contact conditions without ad-hoc rules. Three examples are presented which illustrate the performance of newly proposed algorithm in the public DYNA3D code. DOE

N94-33867# National Lab. for High Energy Physics, Ibaraki (Japan).
GRACE MANUAL
T. Ishikawa, S. Kawabata, Y. Shimizu, T. Kaneko, K. Kato, and H. Tanaka Feb. 1993 248 p
(DE94-727456; KEK-92-19) Avail: CASI HC A11/MF A03

This manual is composed of three kinds of objects, theoretical background for calculating the cross section of an elementary process, usage and technical details of the GRACE system. Throughout this manual we take the tree level process e(sup +)e(sup -) yields W(sup +)W(sup -)gamma as an example, including the e(sup (+-))-scalar boson interactions. The real FORTRAN source code for this process is attached in the relevant sections as well as the results of calculation, which might be a great help for understanding the practical use of the system. DOE

N94-33868# Japan Atomic Energy Research Inst., Tokyo (Japan).
DEVELOPMENT OF THE STATIC ANALYZER ANALYSIS/EX FOR FORTRAN PROGRAMS
Seiji Osanai and Mitsuo Yokokawa Aug. 1993 136 p
(DE94-727537; JAERI-M-93-155) Avail: CASI HC A07/MF A02

The static analyzer 'ANALYSIS' is the software tool for analyzing tree structure and COMMON regions of a FORTRAN program statically. With the installation of the new FORTRAN compiler, FORTRAN77EX(V12), to the computer system at JAERI, a new version of ANALYSIS, 'ANALYSIS/EX', has been developed to enhance its analyzing functions. In addition to the conventional functions of ANALYSIS, the ANALYSIS/EX is capable of analyzing of FORTRAN programs written in the FORTRAN77EX(V12) language grammar such as large-scale nuclear codes. The analyzing function of COMMON regions are also improved so as to obtain the relation between variables in COMMON regions in more detail. In this report, results of improvement and enhanced functions of the static analyzer ANALYSIS/EX are presented. DOE

N94-33878# Argonne National Lab., IL.
A SPREADSHEET ALGORITHM FOR STAGEWISE SOLVENT EXTRACTION
R. A. Leonard and M. C. Regalbuto Aug. 1993 35 p
(Contract W-31-109-eng-38)
(DE94-009735; ANL/CMT/PP-80663) Avail: CASI HC A03/MF A01

The material balance and equilibrium equations for solvent extraction processes have been combined with computer spreadsheets in a new way so that models for very complex multicomponent multistage operations can be setup and used easily. A part of the novelty is the way in which the problem is organized in the spreadsheet. In addition, to facilitate spreadsheet setup, a new calculational procedure has been developed. The resulting Spreadsheet Algorithm for Stagewise Solvent Extraction (SASSE) can be used with either IBM or Macintosh personal computers as a simple yet powerful tool for analyzing solvent extraction flowsheets. DOE

N94-33891 Boeing Aerospace and Electronics Co., Seattle, WA. Systems and Software Engineering.
REUSE STRATEGY MODEL: PLANNING AID FOR REUSE-BASED PROJECTS
Margaret J. Davis 31 Jul. 1993 75 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F19628-88-D-0028)
(AD-A277641; D-613-55159) Avail: CASI HC A04

This document can be used as an aid to realistically plan projects whose philosophical basis is intended to be the STARS vision of megaprogramming. The document contains what is known as the Reuse Strategy Model (RSM). RSM consists of a method for gauging the current state of reuse practice with concurrent identification of goals that support transition to a state closer to the STARS vision. The notion of assessment used in RSM is to characterize what reuse is practice and supported, not how efficiently or effectively reuse is practiced. Rather, it assesses the extent of a transition to domain-specific, reuse-based development both with respect to engineering and management practice and the infrastructure supporting those practices. RSM is intended to be used in support of project planning. The use of RSM assumes that the project's domain(s) of interest is known, the organization(s) involved is known, and the project has been characterized relative to the STARS Conceptual Framework for Reuse Processes (CFRP). This characterization means that the high level goal of the project can be identified as primarily an enactment of one of the CFRP's reuse engineering process families (asset creation, asset management, asset utilization) or as an enactment of the reuse management process categories (reuse planning, domain selection, infrastructure development, technology exploration, etc.). The method provides an assessment of what the current reuse practice is, identifies a set of possible goals that should be then winnowed to be realistic in terms of resources and project duration, and provides conceptual notions of what could be used as measures to gauge progress against those project goals. DTIC

N94-33892 Army Training and Doctrine Command, Fort Monroe, VA.
A TRALINET GUIDE TO THE INTERNET Final Report
Ed Burgess Feb. 1994 49 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277651) Avail: CASI HC A03

Currently, everyone seems to be talking about the Internet. It's a hot topic at conferences, and it's in all the journals. If you talk to the Army community, you will find that a very small number of them are actually using the Internet in any meaningful way. There are many reasons for this state of affairs. The first is that the Internet is not very easy to use. Second, not everyone has access to the Internet. Third, it is a very diffuse system. It is scattered over thousands of computers, and there are no directories. Even worse, if you actually manage to overcome the access problem and find the information that you want, you are likely to be unable to communicate with the computer. This manual will help you to overcome some of these problems. We've identified a few sample resources that may actually be of some assistance to your work. We've identified some techniques that will make it a little easier to connect up to certain computers. We've tried to relate the Internet to TRADOC and TRADOC host computers. We've tried to give some sense of the widening horizons that the Internet can give us. DTIC

N94-33906# Los Alamos National Lab., NM.
A++ AND P++ ARRAY CLASSES FOR ARCHITECTURE INDEPENDENT FINITE DIFFERENCE COMPUTATIONS
R. Parsons and D. Quinlan 15 Mar. 1994 12 p Presented at the 2nd 1994 OONSKI, Object-Oriented Numerics, Sun River, OR, 24 Apr. 1994
(Contract W-7405-eng-36)
(DE94-009321; LA-UR-94-1120; CONF-9404121-2) Avail: CASI HC A03/MF A01

Array class libraries have the potential to support development of a broad class of scientific computations. The high level array syntax coupled with machine dependent internal routines simplifies the structure of scientific codes and hides the details of particular machine architectures. Unfortunately, array class libraries generally suffer from recurring performance problems, making their use on high performance computers difficult to justify. In this paper, we discuss these performance issues for array class libraries and propose optimizations within A++/P++ to address them. Deferred evaluation in A++/P++ provides the information required for these optimizations. We present performance results on example finite difference computations which show that these performance problems can be overcome within array class libraries. The optimizations are equally applicable to more general scientific computations, thus establishing array class libraries as a viable program development strategy for scientific codes. DOE

N94-33912# Stanford Univ., CA. Systems Optimization Lab.
ENHANCED ALGORITHMS FOR STOCHASTIC PROGRAMMING Ph.D. Thesis
A. S. Krishna Sep. 1993 85 p
(Contract DE-FG03-92ER-25116)
(DE94-009423; SU-SOL-93-8) Avail: CASI HC A05/MF A01

In this dissertation, we present some of the recent advances made in solving two-stage stochastic linear programming problems of large size and complexity. Decomposition and sampling are two fundamental components of techniques to solve stochastic optimization problems. We

describe improvements to the current techniques in both these areas. We studied different ways of using importance sampling techniques in the context of stochastic programming, by varying the choice of approximation functions used in this method. We have concluded that approximating the recourse function by a computationally inexpensive piecewise-linear function is highly efficient. This reduced the problem from finding the mean of a computationally expensive functions to finding that of a computationally inexpensive function. Then we implemented various variance reduction techniques to estimate the mean of a piecewise-linear function. This method achieved similar variance reductions in orders of magnitude less time than when we directly applied variance-reduction techniques directly on the given problem. In solving a stochastic linear program, the expected value problem is usually solved before a stochastic solution and also to speed-up the algorithm by making use of the information obtained from the solution of the expected value problem. We have devised a new decomposition scheme to improve the convergence of this algorithm. DOE

N94-33977 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.

SOFTWARE FAULT TOLERANCE: DYNAMIC COMBINATION OF DEPENDABILITY AND EFFICIENCY

J. Xu, A. Bondavalli, and F. DiGiandomenico 1993 24 p Prepared in cooperation with Consiglio Nazionale delle Ricerche, Pisa, Italy

(PB94-148830; TRS-442) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper discusses the problem of attaining a flexible compromise between using redundancy to improve software dependability and limiting the amount of redundancy for efficiency. A new scheme for facilitating software fault tolerance, called the self-configuring optimal programming scheme (SCOP), is presented. The proposed scheme attempts to reduce the resource cost of software fault tolerance, both in space and time, by providing designers with a flexible redundant architecture in which dependability and efficiency can be combined dynamically at run time. The design methodology for SCOP introduces support techniques for flexibly adjusting various attributes of system services including reliability, throughput, and response time. A detailed dependability and efficiency evaluation shows clearly that SCOP can achieve the same dependability level as those of other existing schemes for software fault tolerance, making good use of the available resources. NTIS

N94-33978 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.

NEGATION BY DEFAULT FOR FRAMING IN TEMPORAL LOGIC PROGRAMMING

Z. Duan and C. M. Holt 1993 23 p

(PB94-148848; TRS-441) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

A minimal model based approach for framing in temporal logic programming is presented. Within this model, negation by default is used to manage framing operators. Further, the temporal semantics of the framed programs within the minimal models is investigated. In addition, some of the algebraic properties of the framing operators are characterized. NTIS

N94-33979 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.

FRAMEWORK FOR MODELLING EVOLVING REQUIREMENTS

A. J. C. Blyth, J. Chudge, J. E. Dobson, and M. R. Strens 1993 20 p

(PB94-148855; TRS-455) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The most crucial aspect of software engineering is the gathering of requirements. Increasing the amount of time and improving the quality of effort expended at this stage will lead to fewer and more manageable problems later on in the development life-cycle. The purpose of this paper is to highlight one of the most crucial problems that afflict user organizations when engaging in I.T. systems: the problem that the requirements for the system may change and evolve during the construction of the system. What we propose in this paper is a framework in which evolving and emerging requirements can be dealt with in an iterative manner within a method constructed upon a user-centered design philosophy. This paper is a presentation of recent developments made in the ORDIT project. NTIS

N94-33980 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.

DESIGN AND IMPLEMENTATION OF VOLTAN FAULT-TOLERANT NODES FOR DISTRIBUTED SYSTEMS

N. A. Speirs, S. Tao, F. V. Brasilero, P. D. Ezhilchelvan, and S. K. Shrivastava 1993 25 p

(PB94-148863; TRS-454) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

A VOLTAN node is composed of a number of conventional processors on which application level processes are replicated to achieve fault tolerance. The processors of a node execute agreement and order protocols to 'keep in step'. The design and the implementation of three processor failure masking and a two processor fail-silent nodes using transputers are described in detail. NTIS

N94-34007# Harvard Medical School, Boston, MA. Dept. of Genetics.

COMPUTER ASSISTED MULTIPLEX SEQUENCING

Jul. 1993 6 p

(Contract DE-FG02-87ER-60565)

(DE94-008549; DOE/ER-60565/7) Avail: CASI HC A02/MF A01

The objectives of this project are automation for optimization of multiplex sequencing. We have integrated direct transfer electrophoresis, automated multiplex hybridizations and automated film reading and applied this toward sequencing of E. coli and human DNA. Primers for the directed dideoxy sequence walking and sequence confirmation steps are synthesized to include DNA tags complementary to an alkaline phosphatase conjugate. A higher throughput synthesis device is well along in testing as are new automated hybridization devices. We have developed software for automatically annotating ORFs and databases of precise termini of proteins and RNA. DOE

N94-34010# Sandia National Labs., Albuquerque, NM.

C++ OPTIMIZATION AND EXCLUDING MIDDLE-LEVEL CODE

K. G. Budge 1994 15 p Presented at the 2nd Conference on Object-Oriented Numerics (OONSKI 1994), Sun River, OR, 24 Apr. 1994

(Contract DE-AC04-94AL-85000)

(DE94-008743; SAND-93-3980C; CONF-9404121-1) Avail: CASI HC A03/MF A01

Object-oriented programming was invented to simplify the development and maintenance of complex programs. Its success in achieving this goal is attested to by the growing numbers of programmers who have enthusiastically embraced the use of object-oriented programming languages, particularly C++. Although the C++ community has historically been dominated by programmers of software tools, an increasing number of C++ programmers are from the numerics community. Early efforts at applying C++ to computationally intensive numerical application were stymied by serious performance problems. This has lead some programmers to conclude that computationally intensive codes should use C++ only in their upper levels, and drop into low-level languages such as FORTRAN-77 at lower levels. This leads to the question: What is the domain of applicability of the C++ programming language? For numerical programmers, the answer to this questions depends as much on the efficiency of the object code produced by the C++ compiler as it does on the software engineering characteristics of the C++ language. In this paper, the author will define what is meant by high-level, low-level, and middle-level code and discuss the optimization and software engineering aspects of each. The authors will illustrate how C++ may be used effectively for high-level and low-level code, and discuss the reasons why C++ is not as effective for middle-level code. Finally, the author will discuss some strategies for reducing the amount of middle-level code in C++ programs. These strategies may eliminate the need to use the umbrella paradigm as increasingly mature C++ optimizing compilers become available. DOE

N94-34086# Federated Software Group, Inc., Saint Louis, MO.

CONSTRAINTS AND SYSTEM PRIMITIVES IN ACHIEVING MULTILEVEL SECURITY IN REAL TIME DISTRIBUTED SYSTEM ENVIRONMENT

18 Apr. 1994 116 p

(Contract N00039-93-C-0180)

(AD-A278407) Avail: CASI HC A06/MF A02

The lack of Multilevel Secure (MLS) computer systems within the Department of Defense (DOD) is recognized as a significant shortcoming because it limits data exchange, assimilation, and interoperability. A number

of recent world events have reinforced the operational need for MLS systems that permit the rapid flow of time critical data between classified systems and less secure field-level execution systems. In addition, within complex military equipment, such as submarines or aircraft, the need exists for real-time collection and analysis of MLS data. Since systems such as these involve multiple subsystems, there is an obvious need for distributed operating system capabilities that can function in such environments. The advent of inexpensive, high-performance workstations, and multiprocessor systems has also increased the demand for distributed operating system capabilities. Many development efforts currently underway are implementing client-server architectures to take advantage of the enormous quantities of computing power now available on the user's desktop. Past efforts to build secure systems have resulted in numerous system high computing systems which are limited to a single level of classified data. One result of this has been proliferation of command and control (C2) systems, with one system for each classification level of data. Communication between these systems is typically accomplished via one-way electronic gateways or through the use of magnetic media over an air gap, resulting in significant data redundancy and over classification, time delays, and added expense for redundant equipment and operational costs. DTIC

N94-34110 Oxford Univ. (England). Programming Research Group.
EQUATIONAL REASONING SUPPORT FOR ORWELL
S. P. Wilson 1993 105 p
(PB94-149614; PRG-104) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The report describes the development of an interactive equational reasoning assistant (ERA) for an Orwell type notation. (Orwell is a functional programming language which is very similar to Miranda; Miranda is a trademark of Research Software Ltd.) It is designed to support both proof and program synthesis, using either the inductive or purely calculational styles. Aspects of the tool include pretty printed output, proof schemes, induction hypothesis generation, multiple current proofs, rewriting modulo associativity, and the ability to save proofs mid-stream. NTIS

N94-34122 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
OBJECT-ORIENTED CONSTRUCTION OF FAULT-TOLERANT SOFTWARE
J. Xu and B. Randell 1993 24 p
(PB94-148806; TRS-444) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

Software fault tolerance is often necessary, but itself can be dangerously error-prone because of the additional effort that must be involved in the programming process. Adding redundancy to programs may increase the size and complexity and thus adversely affect software reliability. Object-oriented programming provides a particularly appropriate framework, based on the theory of abstract data types, for enforcing reliability and controlling complexity. This paper introduces an approach to achieving software fault tolerance in object-oriented systems in a disciplined manner and with reduced cost, and discusses the problem of how to incorporate fault tolerance into concurrent object-oriented computing. NTIS

N94-34123 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
PROJECTION IN TEMPORAL LOGIC PROGRAMMING
Z. Duan, M. Koutny, and C. Holt 1993 19 p
(PB94-148814; TRS-452) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

We define a projection operator in the framework of the temporal logic programming. Its syntax and semantics are presented and illustrated with examples. We also discuss the implementation details of the projection construct. NTIS

N94-34124 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
SIMPLE AUTHENTICATION
C. R. Snow and H. Whitfield 1993 24 p
(PB94-148871; TRS-459) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

This paper describes a simple authentication protocol for use with terminal emulation programs running on small workstations, and communicating with a host computer over a (potentially) insecure network. The technique has the advantage that it requires no more network traffic than would be necessary using a standard user-id/password challenge, and also requires only a small amount of additional intelligence at the workstation. Some management issues are also discussed. The system has been implemented on two host systems and two workstation types. NTIS

N94-34141# Lawrence Livermore National Lab., CA.
PROGRAM EPICSHOW: A COMPUTER CODE TO ALLOW INTERACTIVE VIEWING OF THE EPIC DATA LIBRARIES, VERSION 94-1
D. E. Cullen Feb. 1994 46 p
(Contract W-7405-eng-48)
(DE94-009263; UCRL-ID-116819) Avail: CASI HC A03/MF A01

This report discusses the following on the program EPICSHOW: The EPIC System Overview; The Epicshow code; Contents of the Data Bases; Implementing Epicshow; What is Epicshow?; Brief Instruction to the Menu Options; A Guided tour of Epicshow; Z+10, Z-10, etc.: Selecting a Target; Freeze; Major, Minor, etc.: Selecting a Type of Data; Photon, Electron, etc.: Selecting a Projectile; Example Target and Projectile Output; Grids; 2 X 2; Zoom X and Show All; Points; Ratio; Lin/Log X and Y: Linear or Log Scaling; barn-1/cm:Microscopic or Macroscopic; Listing: Tabulated Output Listings; Postscript: Postscript Output; Legend; Bigger and Smaller: Character Size; Bottoms Up and No Bottom; Interpolation of Data; Availability; Using your mouse; Size of Data Bases; Epicshow's Standard Graphic Interface; and Postscript Output to Local Printer. DOE

N94-34205*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
IMPLEMENTATION OF A FULLY-BALANCED PERIODIC TRIDIAGONAL SOLVER ON A PARALLEL DISTRIBUTED MEMORY ARCHITECTURE
Final Report
T. M. Eidson (High Technology Corp., Hampton, VA.) and G. Erlebacher May 1994 56 p Submitted for publication
(Contracts NAS1-19480; NAS1-192999; RTOP 505-90-52-01)
(NASA-CR-194919; NAS 1.26:194919; ICASE-94-37) Avail: CASI HC A04/MF A01

While parallel computers offer significant computational performance, it is generally necessary to evaluate several programming strategies. Two programming strategies for a fairly common problem - a periodic tridiagonal solver - are developed and evaluated. Simple model calculations as well as timing results are presented to evaluate the various strategies. The particular tridiagonal solver evaluated is used in many computational fluid dynamic simulation codes. The feature that makes this algorithm unique is that these simulation codes usually require simultaneous solutions for multiple right-hand-sides (RHS) of the system of equations. Each RHS solutions is independent and thus can be computed in parallel. Thus a Gaussian elimination type algorithm can be used in a parallel computation and the more complicated approaches such as cyclic reduction are not required. The two strategies are a transpose strategy and a distributed solver strategy. For the transpose strategy, the data is moved so that a subset of all the RHS problems is solved on each of the several processors. This usually requires significant data movement between processor memories across a network. The second strategy attempts to have the algorithm allow the data across processor boundaries in a chained manner. This usually requires significantly less data movement. An approach to accomplish this second strategy in a near-perfect load-balanced manner is developed. In addition, an algorithm will be shown to directly transform a sequential Gaussian elimination type algorithm into the parallel chained, load-balanced algorithm. Author

N94-34206*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
AN OVERVIEW OF THE OPUS LANGUAGE AND RUNTIME SYSTEM
Final Report
Piyush Mehrotra and Matthew Haines May 1994 17 p Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194921; NAS 1.26:194921; ICASE-94-39) Avail: CASI HC A03/MF A01

We have recently introduced a new language, called Opus, which provides a set of Fortran language extensions that allow for integrated support of

task and data parallelism. It also provides shared data abstractions (SDA's) as a method for communication and synchronization among these tasks. In this paper, we first provide a brief description of the language features and then focus on both the language-dependent and language-independent parts of the runtime system that support the language. The language-independent portion of the runtime system supports lightweight threads across multiple address spaces, and is built upon existing lightweight thread and communication systems. The language-dependent portion of the runtime system supports conditional invocation of SDA methods and distributed SDA argument handling. Author

N94-34284# Department of the Navy, Washington, DC.
DATA STRUCTURE EXTRACTION, CONVERSION, AND DISPLAY TOOL Patent Application
Joshua Trainer, inventor (to Navy) 10 Jun. 1993 30 p
(AD-D016129; US-Patent-Appl-SN-074514; Navy-Case-74950) Avail: CASI HC A03/MF A01

The present invention relates to a tool, in the form of a computer program, for analyzing computer programs by extracting and converting information about data structures in the program, storing the information about the extracted data structures in a series of random access files forming a relational database, and displaying the stored information as desired. The method for analyzing the computer program using the tool of the present invention includes the steps of inputting a computer program to be analyzed, extracting and converting at least one data structure such as a variable or a table from the program, storing information about the data structure(s) in one or more random access files, and displaying the stored information in either a textual or graphical mode. The program to be analyzed is preferably inputted into the program of the present invention in the form of one or more source code files. It has been found to be successfully applied to the analysis of source code files written in programming language Compiler Monitor-System Version 2Y (CMS-2Y), which is commonly used in military applications. DTIC

N94-34291# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
THE EFFECTIVE USE OF ANIMATION IN SIMULATION MODEL VALIDATION M.S. Thesis
Christopher L. Swider Mar. 1994 143 p
(AD-A278500; AFIT/GOR/ENS/94M-20) Avail: CASI HC A07/MF A02

This study examined two animation displays (moving icons and bar graphs) at two presentation speeds to determine how each of these factors affected the animation's ability to communicate violations of model assumptions. Subjects viewed animation displays individually and in combination at each presentation speed. Eight problem scenarios were presented to evaluate each animation's ability to communicate violations of different assumptions. Each animation's communication ability was measured subjectively and objectively. Subjective measures in the form of pairwise comparisons were used to calculate normalized preference ratings for each animation. Objective measures included problem identification accuracy and problem time. Subjective results indicated that moving icons and the slower presentation speed were the preferred factor levels. However, the combined display of bar graphs and moving icons was preferred most at the slower presentation speed. Objective results indicated that moving icons and the slower presentation speed were factor levels which significantly improved identification accuracy and response time for most problem scenarios. Although subjects preferred the combined display, they performed equally well with either of the two moving icon animations. DTIC

N94-34387*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
EXTENDING HPF FOR ADVANCED DATA PARALLEL APPLICATIONS Final Report
Barbara Chapman (Wien Univ., Austria.), Piyush Mehrotra, and Hans Zima May 1994 31 p Submitted for publication Sponsored by the Austrian Research Foundation and by the Austrian Ministry for Science and Research
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194913; NAS 1.26:194913; ICASE-94-34) Avail: CASI HC A03/MF A01

The stated goal of High Performance Fortran (HPF) was to 'address the problems of writing data parallel programs where the distribution of data affects performance'. After examining the current version of the language we are led to the conclusion that HPF has not fully achieved this goal. While the basic distribution functions offered by the language - regular block, cyclic, and block cyclic distributions - can support regular numerical algorithms, advanced applications such as particle-in-cell codes or unstructured mesh solvers cannot be expressed adequately. We believe that this is a major weakness of HPF, significantly reducing its chances of becoming accepted in the numeric community. The paper discusses the data distribution and alignment issues in detail, points out some flaws in the basic language, and outlines possible future paths of development. Furthermore, we briefly deal with the issue of task parallelism and its integration with the data parallel paradigm of HPF. Author

N94-34921*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ADA DEVELOPERS' SUPPLEMENT TO THE RECOMMENDED APPROACH
Rush Kester (Computer Sciences Corp., Greenbelt, MD.) and Linda Landis (Computer Sciences Corp., Greenbelt, MD.) Nov. 1993 36 p
(RTOP 552-00-00)
(NASA-CR-189345; SEL-81-305SP1; NAS 1.26:189345) Avail: CASI HC A03/MF A01

This document is a collection of guidelines for programmers and managers who are responsible for the development of flight dynamics applications in Ada. It is intended to be used in conjunction with the Recommended Approach to Software Development (SEL-81-305), which describes the software development life cycle, its products, reviews, methods, tools, and measures. The Ada Developers' Supplement provides additional detail on such topics as reuse, object-oriented analysis, and object-oriented design. Author

N94-34952*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
ON THE DESIGN OF CHANT: A TALKING THREADS PACKAGE Final Report
Matthew Haines, David Cronk, and Piyush Mehrotra Apr. 1994 28 p Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-194903; NAS 1.26:194903; ICASE-94-25) Avail: CASI HC A03/MF A01

Lightweight threads are becoming increasingly useful in supporting parallelism and asynchronous control structures in applications and language implementations. However, lightweight thread packages traditionally support only shared memory synchronization and communication primitives, limiting their use in distributed memory environments. We introduce the design of a run time interface, called Chant, that supports lightweight threads with the capability of communication using both point-to-point and remote service request primitives, built from standard message passing libraries. This is accomplished by extending the POSIX threads interface with global thread identifiers, global thread operations, and message passing primitives. This paper introduces the Chant interface and describes the run time issues in providing an efficient, portable implementation of such an interface. In particular, we present performance results of the initial portion of our run time system: point-to-point message passing among threads. We examine the issue of thread scheduling in the presence of polling for messages, and measure the overhead incurred when using this interface as opposed to using the underlying communication layer directly. We show that our design can accommodate various polling methods, depending on the level of support present in the underlying thread system, and imposes little overhead in point-to-point message passing over the existing communication layer. Author

N94-34996*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SOFTWARE MANAGEMENT ENVIRONMENT (SME): COMPONENTS AND ALGORITHMS
Robert Hendrick (Computer Sciences Corp., Greenbelt, MD.), David Kistler (Computer Sciences Corp., Greenbelt, MD.), and Jon Valett Feb. 1994 133 p
(RTOP 552-00-00)
(NASA-CR-189346; SEL-94-001; NAS 1.26:189346) Avail: CASI HC A07/MF A02

This document presents the components and algorithms of the Software Management Environment (SME), a management tool developed for the Software Engineering Branch (Code 552) of the Flight Dynamics Division (FDD) of the Goddard Space Flight Center (GSFC). The SME provides an integrated set of visually oriented experienced-based tools that can assist software development managers in managing and planning software development projects. This document describes and illustrates the analysis functions that underlie the SME's project monitoring, estimation, and planning tools. 'SME Components and Algorithms' is a companion reference to 'SME Concepts and Architecture' and 'Software Engineering Laboratory (SEL) Relationships, Models, and Management Rules.' Author (revised)

N94-33631*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
END EFFECTOR MONITORING SYSTEM: AN ILLUSTRATED CASE OF OPERATIONAL PROTOTYPING
Jane T. Malin, Sherry A. Land, and Carroll Thronesbery *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 461-467 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33632*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE PLAID GRAPHICS ANALYSIS IMPACT ON THE SPACE PROGRAM
Jennifer P. Nguyen (Lockheed Engineering and Sciences Co., Houston, TX.), Aneice L. Wheaton (Lockheed Engineering and Sciences Co., Houston, TX.), and James C. Maida *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 468-474 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-33633*# Compaq Computer Corp., Houston, TX.
HUMAN FACTORS INVOLVEMENT IN BRINGING THE POWER OF AI TO A HETEROGENEOUS USER POPULATION
Mary Czerwinski and Trung Nguyen *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 475-482 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34047*# Michigan Univ., Ann Arbor, MI. Artificial Intelligence Lab.
LEARNING PROCEDURES FROM INTERACTIVE NATURAL LANGUAGE INSTRUCTIONS
Scott B. Huffman and John E. Laird *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 207-216 (For primary document see N94-34019 10-99)
(Contract NCC2-517)
Avail: CASI HC A02/MF A04

N94-34054*# Wyoming Univ., Laramie, WY. Computer Science Dept.
TRANSLATION BETWEEN REPRESENTATION LANGUAGES
Jeffrey VanBaalen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 261-267 (For primary document see N94-34019 10-99)
(Contracts NAG2-581; NCC2-537; F49620-92-J-0434; ARPA Order 8607)
Avail: CASI HC A02/MF A04

N94-34055*# Washington State Univ., Pullman, WA. School of Electrical Engineering and Computer Science.
A MACHINE-LEARNING APPRENTICE FOR THE COMPLETION OF REPETITIVE FORMS
Leonard A. Hermens and Jeffrey C. Schlimmer *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 268-275 (For primary document see N94-34019 10-99)
(Grant NSF-92-1290)
Avail: CASI HC A02/MF A04

N94-34059*# Stanford Univ., CA.
AGENT ORIENTED PROGRAMMING Abstract Only
Yoav Shoham *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 303 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34060*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PI IN THE SKY: THE ASTRONAUT SCIENCE ADVISOR ON SLS-2
Lyman R. Hazelton (Massachusetts Inst. of Tech., Cambridge.), Nicolas Groleau, Richard J. Frainier, Michael M. Compton, Silvano P. Colombano, and Peter Szolovits *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 304-312 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34062*# Rutgers Univ., New Brunswick, NJ. Dept. of Computer Science.
A TOOLBOX AND A RECORD FOR SCIENTIFIC MODEL DEVELOPMENT
Thomas Ellman *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 321-328 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34336# Hawaii Univ., Manoa, HI. Dept. of Electrical Engineering.
COMPUTER AIDED DESIGN OF ROBOTIC CONTROL SYSTEMS
H. H. Hwang and Alvin Louie *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 122-125 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34352# Nanjing Univ. (China). Inst. of Science and Technology.
HIGH ACCURACY APPROXIMATION OF OFFSET CURVES WITH RATIONAL GEOMETRIC SPLINES
Yan-Chun Wang and Yong-Jun Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 198-201 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34353# Hong Kong Polytechnic, Kowloon. Dept. of Manufacturing Engineering.
DIMENSIONAL MEASUREMENT TO SUBPIXEL VALUE
Paul S. Wu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 203-206 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34357# Nanjing Aeronautical Inst. (China).
THE APPLICATION OF THE BI-PHASE CODING IN THE SERIAL TRANSFER
Shen-Ling Yu and Jun Zhou *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 220-222 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

N94-34363# Jiangsu Inst. of Tech., Zhenjiang (China). Dept. of Computer Engineering.
A PC-BASED MEASUREMENT AND TEST SYSTEM FOR DIGITAL CONTROLLER
Jian-Wen Huang, Zou-Jue Chen, Wai-Ping Dai, Ning Wang, and Chang Hu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference

on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 249-252 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

62 COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N94-33395 Naval Surface Warfare Center, Silver Spring, MD.
TASK ALLOCATION AND SCHEDULING FOR HIGH LEVEL SYNTHESIS
Eric J. Ogata and Edward A. Cohen 21 Mar. 1994 60 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A277570; NAVSWC-TR-91-538) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report addresses the development of automated techniques for solving resource allocation problems in the high level synthesis of system designs. These techniques are developed with the objective of supporting the design of highly complex systems that are characterized by an extremely large number of physical components of many different types, with complex interconnections and interdependencies. The purpose of the systems that are developed using these techniques is to implement a set of logical functions that define the overall system behavior. These logical functions can be described as a set of communicating tasks that pass data and control signals from one to another. The set of logical tasks must be mapped onto the physical resources from which the system is constructed. There may be many different ways to map logical system tasks onto the hardware resources. A particular mapping can be scored according to how well it satisfies some overall system design goal such as fault tolerance or rapid response time. The questions as to how to identify optimal mappings that maximize or minimize some design parameter is important. This report represents the results of investigations of the performance of four different techniques for identifying optimal or near-optimal allocations given a particular optimization goal. DTIC

N94-33400 Fuentez Systems Concepts, Inc., Fairfax, VA.
KNOWLEDGE BASED MULTI-LEVEL SECURE NETWORK TECHNOLOGY Final Report, Dec. 1990 - Aug. 1993
Thomas C. Housman and Raymond M. Fuentez Dec. 1993 68 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F30602-89-C-0085)
(AD-A278043; FSC-F085-A009; RL-TR-93-257) Avail: CASI HC A04

The application of artificial intelligence technology to assist analysts in the field to identify Sensitive Compartmented Information (SCI) which must be sanitized and disseminated to U.S. Military commanders was investigated and documented. The current manual methods were modeled and used in the design of an expert system prototype to perform the following functions: (1) identifying time critical SCI needed by the commanders; (2) associating the SCI with related intelligence from other sources; (3) determining the processing required to sanitize the SCI to appropriately classified collateral (non-SCI) reports; and (4) automatically generating and displaying to the operator the sanitized reports. The prototype was installed and tested at Rome Laboratory, Griffiss AFB NY 13441-4505. DTIC

N94-33740# Pittsburgh Univ., PA. Dept. of Electrical Engineering.
WAVELET TRANSFORMS IN PARALLEL IMAGE PROCESSING Final Technical Report, 1 Jun. 1990 - 31 Jul. 1993
Ching-Chung Li and Richard W. Hall 27 Jan. 1994 137 p
(Grant AF-AFOSR-0310-90)
(AD-A278372; TR-CV-93-07; AFOSR-94-0158TR) Avail: CASI HC A07/MF A02

This project consists of two parts: applications of wavelet transforms in multiscale image processing, and parallel algorithms and architectures. We have studied issues in wavelet-based edge detection: antisymmetry of wavelet filters and their support size with respect to edge localization and a nonorthogonal four-coefficient wavelet edge detector. Texture segmentation using a modulated Daubechies wavelet has been studied, providing both spatial frequency and orientation selectivity. Object segmentation has been studied by examining silhouettes at multiple resolutions in piecewise linear approximations and has been explored on LADAR data for use in target recognition. Applications to biomedical image compression, image halftoning, and artificial neural network structure have also been investigated. In parallel processing, we have studied embeddings of wavelet transform algorithms as well as other algorithms for two dimensional (2D) and three dimensional (3D) mesh architectures and systolic arrays, and their time complexities have been evaluated. A variety of issues are addressed in utilization of 3D meshes in parallel image processing on 2D and 3D images including: the embedding of 2D images into 3D meshes, 3D shrinking incorporating subfields methodology, 3D connected component labeling, and segmentation in magnetic resonance imaging. Some fundamental issues for parallel reduction and reduction-augmentation operators in 2D and 3D image spaces have been examined. DTIC

N94-33777 California Univ., San Diego, La Jolla, CA.
PARALLEL PROGRAMMING METHODOLOGIES FOR NON-UNIFORM STRUCTURED PROBLEMS IN MATERIALS SCIENCE Interim Report, 1 Dec. 1992 - 30 Sep. 1993
Scott B. Baden Oct. 1993 30 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-93-1-0152)
(AD-A277868) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The purpose of this investigation is to explore software techniques for reducing the development costs of scientific applications running on distributed memory MIMD parallel computers. Our objective is to develop a domain specific software development tool called LPAR. LPAR is targeted to non-uniform numerical methods that employ elaborate representations--such as adaptive and multilevel finite difference meshes or particles--to accurately capture irregular phenomena such as turbulence and shocks. We are using LPAR to develop new parallel software techniques and numerical algorithms for the predictive modeling of technologically important materials using first principles simulations. DTIC

N94-33908# Los Alamos National Lab., NM.
OBJECT-ORIENTED PARTICLE SIMULATION ON PARALLEL COMPUTERS
J. V. W. Reynders, D. W. Forslund, P. J. Hinker, M. Tholburn, D. G. Kilman, and W. F. Humphrey 1994 15 p Presented at the 2nd 1994 OONSKI, Object-Oriented Numerics Conference, Sun River, OR, 24 Apr. 1994
(Contract W-7405-eng-36)
(DE94-009353; LA-UR-94-966; CONF-9404121-3) Avail: CASI HC A03/MF A01

A general purpose, object-oriented particle simulation (OOPS) library has been developed for use on a variety of system architectures with a uniform high-level interface. This includes the development of library implementations for the CM5, Intel Paragon, and CRI T3D. Codes written on any of these platforms can be ported to other platforms without modifications by utilizing the high-level library. The general character of the library allows application to such diverse areas as plasma physics, suspension flows, vortex simulations, porous media, and materials science. DOE

N94-33976 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
TOPOLOGICAL PROPERTIES OF TYPICAL INTERCONNECTION NETWORKS: FAULT TOLERANCE, COMMUNICATION DELAY AND CONNECTION COST
J. Xu and Q. Lee 1993 22 p Prepared in cooperation with University of Southern California, Los Angeles
(PB94-148822; TRS-443) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper presents a quantitative and comprehensive analysis of topological properties of typical interconnection networks including D-ary trees, nearest-neighbor meshes (NNM), hypercubes, and Illiac networks. An alternative measure of network fault tolerance is introduced and expressed as the ability of a system to preserve its topological characteristics. The new measure can reflect implicitly the capability of the system to map algorithms designed for its original topology onto its possible degraded forms in the presence of faults. The paper includes the derivation of

closed form expressions for average communication delay in tree structures, NNM meshes, and binary N-cube networks. For Illiac networks, a method for precisely computing maximum communication delay and average delay is developed, and it is concluded that the optimal step length s = square root of n for even square root of n and s = (square root of n) + 1 for odd square root of n. Based on these results, a new class of hyperbus networks is constructed. The proposed networks possess more attractive features, in terms of their flexibility in a tradeoff between fault tolerance and computational performance, than other multibus networks such as spanning bus hypercubes and generalized hypercubes. NTIS

N94-33987# Oak Ridge National Lab., TN.
ANALYZING PICL TRACE DATA WITH MEDEA
A. P. Merlo (Pavia Univ., Italy.) and P. H. Worley 1994 24 p Presented at the 7th International Conference on Modeling Techniques and Tools for Computer Performance Evaluation, Vienna, Austria, 4-6 May 1994
(Contract DE-AC05-84OR-21400)
(DE94-009173; CONF-9405115-1) Avail: CASI HC A03/MF A01

Execution traces and performance statistics can be collected for parallel applications on a variety of multiprocessor platforms by using the portable instrumented communication library (PICL). The static and dynamic performance characteristics of performance characteristics of performance data can be analyzed easily and effectively with the facilities provided within the measurements description evaluation and analysis tool (MEDEA). A case study is then outlined that uses PICL and MEDEA to characterize the performance of a parallel benchmark code executed on different hardware platforms and using different parallel algorithms and communication protocols. DOE

N94-34125 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
BUILDING FAULT-TOLERANT DISTRIBUTED COMPUTING SYSTEMS USING STANDARD COMPONENTS
P. A. Barrett, S. K. Shrivastava, N. A. Speirs, and A. Waterworth 1993 15 p
(PB94-148889; TRS-449) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper investigates the possibility of constructing fault-tolerant computer systems using standard hardware components, replicated to an appropriate degree and communicating via special-purpose software protocols. The Voltan family of fail-controlled nodes is introduced and described, and ways of incorporating Voltan nodes into Integrated Modular Avionics (IMA) architectures are presented. Means of overcoming the potential drawbacks of such nodes are discussed. In particular, possible extensions to IMA gateway modules in order to provide communications and data validation services in support of Voltan nodes are described. NTIS

N94-34126 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.
MODELS FOR ASYNCHRONOUS CIRCUIT BEHAVIOUR WITH OR CAUSALITY
A. Yakovlev, M. Kishinevsky, A. Kondratyev, and L. Lavagno 1993 30 p Prepared in cooperation with Technical Univ. of Denmark, Lyngby and Politecnico di Torino, Italy
(PB94-148897; TRS-463) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper investigates OR causality. The paradigm is different from the classical MERGE paradigm, which is based on mutually exclusive events. It has its own subtypes. Petri nets and Change Diagrams provide adequate modeling and circuit synthesis tools for the various OR causality types, yet they do not always bring the specifier to a unique decision about which modeling construct must be used for which type. The authors present a unified descriptive tool, called Causal Logic Net, which is graphically based on a Petri net but has an explicit logic causality annotation for transitions. It is aimed as the least possible generalization of Petri nets and Change Diagrams. The signal-transition interpretation of this tool is analogous to, but more powerful than, the well-known Signal Transition Graph. A number of examples demonstrate the usefulness of this model in the synthesis of asynchronous control circuits. NTIS

N94-34297# Los Alamos National Lab., NM.
MANAGEMENT ISSUES IN AUTOMATED AUDIT ANALYSIS
K. A. Jackson, J. G. Hochberg, S. K. Wilhelmy, J. F. McClary, and G. G. Christoph 1994 18 p Presented at the 16th DOE Computer Security Group Training Conference, Denver, CO, 3-5 May 1994
(Contract W-7405-eng-36)
(DE94-007571; LA-UR-94-592; CONF-9405111-1) Avail: CASI HC A03/MF A01

This paper discusses management issues associated with the design and implementation of an automated audit analysis system that we use to detect security events. It gives the viewpoint of a team directly responsible for developing and managing such a system. We use Los Alamos National Laboratory's Network Anomaly Detection and Intrusion Reporter (NADIR) as a case in point. We examine issues encountered at Los Alamos, detail our solutions to them, and where appropriate suggest general solutions. After providing an introduction to NADIR, we explore four general management issues: cost-benefit questions, privacy considerations, legal issues, and system integrity. Our experiences are of general interest both to security professionals and to anyone who may wish to implement a similar system. While NADIR investigates security events, the methods used and the management issues are potentially applicable to a broad range of complex systems. These include those used to audit credit card transactions, medical care payments, and procurement systems. DOE

N94-34683*# Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering and Program of Computer Graphics.
PARALLEL PROCESSING FOR NONLINEAR DYNAMICS SIMULATIONS OF STRUCTURES INCLUDING ROTATING BLADED-DISK ASSEMBLIES Final Technical Report
Shang-Hsien Hsieh May 1993 153 p
(Grants NAG3-1063; AF-AFOSR-0211-90)
(NASA-CR-194567; Rept-93-2; NAS 1.26:194567) Avail: CASI HC A08/MF A02

The principal objective of this research is to develop, test, and implement coarse-grained, parallel-processing strategies for nonlinear dynamic simulations of practical structural problems. There are contributions to four main areas: finite element modeling and analysis of rotational dynamics, numerical algorithms for parallel nonlinear solutions, automatic partitioning techniques to effect load-balancing among processors, and an integrated parallel analysis system. Derived from text

63 CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support.*

N94-33403# Bell Communications Research, Inc., Livingston, NJ.
RESEARCH IN VLSI SYSTEM IMPLEMENTATION OF NEUROMORPHIC LEARNING NETWORKS Final Report, 1 Nov. 1992 - 31 Oct. 1994
Joshua Alspector 31 Oct. 1994 6 p
(Contract F49620-92-C-0075)
(AD-A278247; AFOSR-94-0217TR) Avail: CASI HC A02/MF A01

The methodology of the researchers was to build experimental prototype learning systems. The researchers wanted to accomplish the following: develop a prototype of an enhanced neuron/synapse chip using some ideas that they have gained from existing chips; develop a prototype VME based experimental platform for the above devices; write experimental prototype system software to run the above prototype boards and chips as co-processors for typical computer system such as a SUN4; and develop new algorithms to perform other types of learning suitable for prototype VLSI implementation. The following results were achieved: System Level Hardware-redesigned prototype learning chips were fabricated; System Level Software-software modules to interface with the prototype system was written; and simulation experiments were carried out to gauge the efficiency of one-weight-at-a-time vs. parallel perturbations. DTIC

N94-33542 Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
A FORTRAN BASED LEARNING SYSTEM USING MULTILAYER BACK-PROPAGATION NEURAL NETWORK TECHNIQUES M.S. Thesis
Gregory L. Reinhart Mar. 1994 102 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A278463; AFIT/GOR/ENS/94M-11) Avail: CASI HC A06

An interactive computer system which allows the researcher to build an 'optimal' neural network structure quickly, is developed and validated. This system assumes a single hidden layer perceptron structure and uses the back-propagation training technique. The software enables the researcher to quickly define a neural network structure, train the neural network, interrupt training at any point to analyze the status of the current network, re-start training at the interrupted point if desired, and analyze the final network using two-dimensional graphs, three-dimensional graphs, confusion matrices and saliency metrics. A technique for training, testing, and validating various network structures and parameters, using the interactive computer system, is demonstrated. Outputs automatically produced by the system are analyzed in an iterative fashion, resulting in an 'optimal' neural network structure tailored for the specific problem. To validate the system, the technique is applied to two, classic, classification problems. The first is the two-class XOR problem. The second is the four-class MESH problem. Noise variables are introduced to determine if weight monitoring graphs, saliency metrics and saliency grids can detect them. Three dimensional class activation grids and saliency grids are analyzed to determine class borders of the two problems. Results of the validation process showed that this interactive computer system is a valuable tool in determining an optimal network structure, given a specific problem. DTIC

N94-33690# Oak Ridge National Lab., TN.
ON STOCHASTIC APPROXIMATION ALGORITHMS FOR CLASSES OF PAC LEARNING PROBLEMS
N. S. V. Rao, V. R. R. Uppuluri, and E. M. Oblow 1994 6 p Presented at the IEEE World Congress on Computational Intelligence, Lake Buena Vista, FL, 28 Jun. - 2 Jul. 1994
(Contract DE-AC05-84OR-21400)
(DE94-007417; CONF-940699-2) Avail: CASI HC A02/MF A01

The classical stochastic approximation methods are shown to yield algorithms to solve several formulations of the PAC learning problem defined on the domain closed interval (0,1)(sup d). Under some assumptions on different ability of the probability measure functions, simple algorithms to solve some PAC learning problems are proposed based on networks of nonpolynomial units (e.g. artificial neural networks). Conditions on the sizes of these samples required to ensure the error bounds are derived using martingale inequalities. DOE

N94-33744 Illinois Univ., Champaign, IL.
REAL-TIME ADAPTIVE CONTROL OF MIXING IN A PLANE SHEAR LAYER Final Report, 15 Jan. 1990 - 14 Jul. 1993
Arne J. Pearlstein 2 Feb. 1994 66 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0156-90)
(AD-A278379; AFOSR-94-0163TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Work was conducted on two projects related to real-time control of shear flows. In the first, two dimensional unsteady simulations of the development of the wake behind a circular cylinder impulsively started into rotatory and rectilinear motion were performed. This simulation code is now serving as a testbed for the development of open and closed-loop strategies for control of the lift/drag ratio as well as the suppression of vortex shedding. The code has been checked by comparison to earlier computational and experimental work. In the second project, a technique was developed to extract both velocity components in a two dimensional incompressible flow from measurements of a single scalar (temperature or concentration), and all three velocity components in a three dimensional incompressible flow from measurements of two scalars. The technique is applicable to steady or unsteady, laminar or turbulent flows. A key advantage over particle image velocimetry and other multipoint techniques is that our method uses full-field optical measurements, so that spatial resolution is not limited by particle size and loading restrictions. DTIC

N94-33755# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
AN ANALYSIS OF STOPPING CRITERIA IN ARTIFICIAL NEURAL NETWORKS M.S. Thesis
Bruce Kostal Mar. 1994 159 p
(AD-A278491; AFIT/GST/ENS/94M-07) Avail: CASI HC A08/MF A02

The goal of this study was to decide when to terminate training of an artificial neural network (ANN). In pursuit of this goal, several characteristics of the ANN were monitored throughout ANN training: classification error rate (of the training set, testing set, or a weighted average of the two); moving average classification error rate; measurements of the difference between ANN output and desired output (error sum of squares, total absolute error, or largest absolute error); or ANN weight changes (absolute weight change, squared weight change, or relative weight change). Throughout this research, the learning rate was held constant at 0.35. The momentum was not used because the primary interest of this study was evaluating when to terminate training as opposed to the speed of reaching a decision. The ANN structure was held constant with two input features, two output classes, and one hidden layer. Finally, the practice of training after processing each exemplar was followed. Results indicated three conclusions. First, multiple runs are required for ANN analysis because ANN's are not guaranteed to converge to the same solution. Second, the classification error rate, a moving average of the classification error rate, and the total absolute error (all computed on the testing set) provided a similar final classification. Third, once the stopping criteria functions cease to decrease, select a set of ANN final weights at random. On average, they yielded as low as or lower classification error rate and variance of the classification error rate than other possible choices. DTIC

N94-33838# Sandia National Labs., Albuquerque, NM.
THE EXPANDED ROLE OF SOFTWARE IN A CONTROL SYSTEM
J. Damico 1994 10 p
(Contract DE-AC04-76DP-00789)
(DE94-007524; SAND-94-8574C) Avail: CASI HC A02/MF A01

Disposal of hazardous wastes such as chemical waste and military munitions present a serious environmental challenge. A new technology, Supercritical Water Oxidation (SCWO), provides a safer, cleaner process for disposing of these and other wastes. Sandia National Laboratories built a SCWO reactor called the Engineering Evaluation Reactor (EER) to study the SCWO process. Designed as a flexible testbed, the EER required a control system that would accommodate a variety of experimental instruments, configurations and control schemes. Due to safety concerns, the design required that the control system provide remote operation of the reactor. In the recent past, such a control system would be custom built from hardware components. The EER control system implemented many hardware functions in software and proved more flexible than a more hardware oriented system. This paper describes the design and implementation of the EER control system and discusses the advantages of a software based control system. DOE

N94-33855 Yale Univ., New Haven, CT. Dept. of Electrical Engineering.
ADAPTIVE STABILIZATION OF LINEAR AND NONLINEAR SYSTEMS Final Report, 1 Jan. 1992 - 31 Dec. 1993
A. S. Morse 14 Mar. 1994 9 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0077)
(AD-A278270; AFOSR-94-0239TR) Avail: CASI HC A02

With AFOSR support, a new strategy called 'cyclic switching' has been devised for dealing with the well-known, long standing, certainty equivalence control synthesis problem which arises in the design of identifier-based adaptive controllers because of the existence of points in the parameter space where the design model upon which certainty equivalence synthesis is based, loses stabilizability. The concept is provably correct, easily implemented, and applicable to both siso and mimo linear systems, whether they are minimum phase or not. The feasibility has been established of an entirely new method of supervisory control called 'dwell-time switching'. Dwell time switching is a simple on-line logic capable of determining in real time which controller from a family should be put in feedback with a process as to achieve satisfactory performance. The method is intended to be used in situations where there is substantial process model uncertainty, so much so in fact that no single fixed parameter, linear control can possibly work. DTIC

N94-33968# Charles River Analytics, Inc., Cambridge, MA.
A NEURAL/EXPERT BASED CLIENT SERVER ARCHITECTURE FOR MITE ITS Final Report
J. M. Mazzu, S. M. Botros, and A. K. Caglayan Feb. 1994 50 p
(Contract DAAH01-93-C-R327)
(AD-A278330; R9305) Avail: CASI HC A03/MF A01

A MITE (multi-node, interactive, task-sharing, expert-instruction) system, in general, is responsible for determining task allocation strategies for members of a team who must work together over a computer network to accomplish an overall objective. The MITE system must adapt to changing skill and performance levels of the team members and continually reallocate the tasks to insure optimal team performance. In order to best allocate tasks among team members, the MITE system should maintain internal models of the member's capacity and knowledge relating to the tasks which that member may be allocated. The system should also provide expert recommendations and instruction for team members to improve performance. In this Phase 1 study, while investigating the application of hybrid neural network/knowledge base strategies to the problem of MITE systems, we also look for foundation technologies that can be applied to current or future commercial products with high potential returns. Designing the MITE system with an object-oriented clint/server architecture provides the necessary reusability of code objects for a variety of application domains. For example, the complete MITE system can be used for both Army weapons systems, such as Avenger, and large scale manufacturing applications. The task allocation objects can be used within MITE systems or for single user project scheduling. The neural network objects developed for the task allocation module can also be extracted and used for a variety of other optimization problems. DTIC

N94-34296# Los Alamos National Lab., NM.
IDENTIFICATION OF MECHANICAL SYSTEMS USING PROBABILISTIC NEURAL NETWORKS
N. F. Hunter 1994 9 p Presented at the Annual Technical Meeting and Exposition of the Institute of Environmental Sciences, Rosemont, IL, 1-6 May 1994
(Contract W-7405-eng-36)
(DE94-007555; LA-UR-94-689; CONF-940510-3) Avail: CASI HC A02/MF A01

Modal vibration testing is a common means of quantifying the dynamic behavior of linear mechanical systems. We present the results of a series of modal tests on component subassemblies. Two distinct types of assemblies were tested. Each assembly was tested with and without a small component package present. Our results show: (1) The typical variation of the transfer functions between test units for these relatively complicated assemblies. (2) The effect on the transfer function of the addition of the small component package to the assembly. A probabilistic neural network estimates the most likely configuration (component package present or absent) based on the measured transfer function data. Further analysis allows us to estimate the probability of a correct configuration estimate. The method is applicable to determining, given a set of units of a in a certain configuration and a unit with an unknown configuration, the degree to which the unknown units response is 'typical' of the set of units used for comparison. DOE

N94-34308# Nanjing Aeronautical Inst. (China).
PROCEEDINGS OF THE ASIA-PACIFIC CONFERENCE ON CONTROL AND MEASUREMENT (APCCM 1993), VOLUME 10, NO. 1
1993 306 p Conference held in Kunming, China, 5-7 Dec. 1993 Sponsored by Jiangsu Society of Aeronautics and Astronautics and IEEE
(ISSN 1005-1120)
Avail: CASI HC A14/MF A03

These conference proceedings have 65 papers. The scope of the papers consists of: automatic control theory and applications, adaptive control, robust control, robotic control, intelligent control, variable structure control, optimal control, neural network control, distributed control, process control, fault diagnostics and detection, intelligent sensors, fiber optical sensors, digital image measurement, microcomputer and measurement technology. The papers are divided as follows: control theory and applications, flight control, control on industry and engineering and others, and measurement and test. It is believed the conference will have rendered international communication and scientific and technological exchanges for promotion of control and measurement science. For individual titles, see N94-34309 through N94-34372.

N94-34309# Hong Kong Polytechnic, Kowloon. Dept. of Electronic Engineering.
PARAMETERISED CONTROLLER DESIGN FOR DOMINANT MULTIVARIABLE SYSTEMS
L. F. Yeung *In* Nanjing Aeronautical Inst, Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 1-5 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

Diagonal decentralized approach enables a complex design to be decomposed into a number of SISO designs and it is also more akin to the actual practice found in many process systems. One main problem of this approach is the attainment of the necessary diagonal dominance condition (DDC). Recently Yeung and Bryant proposed a number of ways to measure system dominance and algorithms to achieve it. In this paper, a new parameterized precompensator design technique is proposed to stabilize the system and at the same time to improve the dominance measure. The parameterized controller form can be seen as a general form, and many common forms like PID for instance, can be realized by choosing the appropriate parameters. Two min-max algorithms for finding such controllers are proposed here: one is to transform the design into an LP problem, and one is to employ the feasible set algorithm. Author

N94-34310# National Chiao Tung Univ., Hsinchu (Taiwan). Dept. of Control Engineering.
SYNTHESIS OF MODEL REFERENCE LQG OPTIMAL SYSTEMS
Yu-Ping Lin and Maan-Huang Tu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 6-10 (For primary document see N94-34308 10-63)
(Grant NSC-81-0414-E009-523)
Avail: CASI HC A01/MF A03

In this paper, the optimal controller in model reference LQG systems is developed. The condition for satisfying the return difference equality is investigated. Some special cases are also discussed. Author

N94-34311# Shanghai Normal Univ. (China).
REVISITING THE CONNECTION PROBLEM OF IDENTIFICATION AND CONTROL
Zhen-Dong Yuan *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 11-14 Sponsored by National Natural Science Foundation (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

M. Gevers (1991) pointed out that connecting identification and robust control is a new challenge in the control theory. Surely, the research on this topic will lead to a revolutionary change in system identification and control design. In this paper, the interaction between identification and control, model quality and control design theory matched with identification are discussed and some new results are introduced. Author

N94-34312# Kumamoto Univ. (Japan). Faculty of Engineering.
IDENTIFICATION OF 2ND AND 3RD VOLTERRA KERNEL OF NONLINEAR SYSTEMS
Hiroshi Kashiwagi, Sun Yeping, and Eiji Nishiyama *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 15-19 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A new method is proposed for obtaining Volterra kernels of a nonlinear system by use of pseudorandom M-sequences and correlation technique. M-sequence is applied to a nonlinear system and the cross-correlation function between the input and the output displays not only the linear impulse response of the linear part of the system, but also cross-sections of the Volterra kernels nonlinear system. Simulations are carried out for up

to 3rd Volterra kernel, and the results show a good agreement with the theoretical considerations. Author

N94-34313# Hong Kong Univ. Dept. of Electrical and Electronic Engineering.
H-INFINITY ESTIMATION
Y.-S. Hung and C.-Y. Han *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 20-24 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A differential game is considered in which two players try to minimize and maximize an integral mean-square-error payoff function associated with a state estimation problem. A family of saddle-point solutions is obtained and it is shown how the results for the game problem are related to H infinity filtering. Author

N94-34314# Chung Cheng Inst. of Tech. (Taiwan).
STABILIZATION OF FLEXIBLE SYSTEMS UNDER A CERTAIN CLASS OF NONLINEAR FEEDBACK CONTROLS
Chun-Liang Lin and Van-Tsai Liu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 25-29 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A new approach to treat the stabilization problem for a certain class of nonlinear feedback controls of infinite-dimensional flexible systems with finite-dimensional dynamic compensators is presented. Under some practical and convenient hypotheses, we investigate the stability condition which may guarantee the compensator to be a stabilizing one. Several useful stability results deduced from the presented condition are also provided. Author

N94-34315# Hong Kong Polytechnic, Kowloon. Dept. of Mathematics.
FEEDBACK STABILIZATION OF MATRIX SECOND-ORDER SYSTEMS BY SOLVING RICCATI EQUATION
D. W. C. Ho and H.-C. Chan *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 30-34 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper emphasizes on the issue of stabilization of second order systems by using feedback control. An algorithm for finding the stabilizing feedback matrix by solving the well known Algebraic Riccati Equation is described. The proposed method is fairly easy to be implemented and provides a direct solution to a class of damped-gyroscopic second-order systems. Numerical results are presented to demonstrate the proposed technique. Author

N94-34316# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE STUDY OF OPTIMAL CONTROL WITH NEURAL NETWORKS
Xiao-Gang Ruan and Suo-Feng Guo *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 1 0, No. 1 1993 p 35-38 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

An optimal control scheme based on artificial neural networks is presented in this paper, the most important of which is a nonlinear state-feedback controller that is implemented with a BP neural network. The input of the network is the state vector of the controlled system and the output is the optimal control function which minimizes the objective function with a quadratic performance index. Author

N94-34317# Tongji Univ., Shanghai (China). Dept. of Automatic Control.
A CONTINUOUSLY TUNED ADAPTIVE ROBUST CONTROLLER
Yan-Hua Xu, Song-Jiao Shi, and Zhong-Jun Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 39-41 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, a new approach for the adaptive robust control is investigated, which composes a family of robust controllers and a neural networks tuner. Simulation results for the closed loop system using this composite controller is presented. Author

N94-34318# Northeast Coll. of Technology, Shenyang (China). Dept. of Automatic Control.
STRUCTURAL CONTROLLABILITY OF A CLASS OF COMPOSITE SYSTEMS COMPOSED OF SUBSYSTEMS WITH IDENTICAL STRUCTURE
Guang-Hong Yang and Si-Ying Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 42-46 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper discusses a class of composite systems composed of subsystems with identical structure. Under some mild conditions on the interconnections, it is shown that the structural controllability (structural observability) for such a composite system can be determined by the corresponding properties for the modified subsystem of the system. Author

N94-34319# Nanjing Aeronautical Inst. (China).
AN ACCELERATED GRADIENT METHOD FOR ADAPTIVE CONTROL USING ONLY INPUT AND OUTPUT MEASUREMENTS
Jin-Quan Huang, Jian-Guo Sun, and Xiao Liu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 47-51 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, an accelerated gradient method is introduced. A 'proportional plus integral' (PI) adaptation law of model reference adaptive control (MRAC) using only input and output (I/O) measurements of the plant is proposed. Compared to the conventional integrated adaptation law, the PI adaptation law has striking new properties with respect to transient and steady state behavior, particularly in faster adaptation. The adaptive law proposed is also beneficial in the presence of parameter variations, bounded disturbances, nonlinearities and unmodelled dynamics. Computer simulation of some examples illustrated the good performance of the proposed adaptive controller. Author

N94-34320# Harbin Inst. of Tech. (China).
H INFINITY/LTR STATE FEEDBACK CONTROL
Zheng-Xin Weng and Guang-Xiong Wang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 52-55 Sponsored by National Doctoral Subject Foundation (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper presents a so-called H infinity optimal synthesis method with Loop-Transfer-Recovery (H infinity/LTR) which recovers robust stability and performance specifications to a specified degree. This method requires two steps. First, a full state feedback H infinity controller is designed to satisfy the design specifications, such as performance and robust stability. Second, an observer-based dynamic controller is designed to approximately recover the performance and robustness of the full state controller. A case study is presented to illustrate the proposed method. Author

N94-34321# Fudan Univ., Shanghai (China). Dept. of Mathematics.
INFINITE DIMENSIONAL GENERALIZED TIME OPTIMAL CONTROL PROBLEM
Li-Ping Pan and Xun-Jing Li *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 56-58 Sponsored by National Natural

Science Foundation of China and Chinese Education Commission (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper we investigate a class of so-called generalized time optimal control problem. It is a natural extension to the standard time optimal control problem and its solution can still afford us a kind of 'optimal choice' to many situations for which the solutions of the correspondingly standard time optimal control problems do not exist. Author

N94-34322# Zhejiang Univ. (China). Dept. of Electrical Engineering.
ROBUST STABILIZATION OF NONLINEAR SYSTEMS WITH A CLASS OF UNMATCHED UNCERTAINTIES
Xu-Dong Ye and Jing-Ping Jiang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 59-61 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The paper addresses the state regulation problem of nonlinear systems with a class of unmatched uncertainties. A robust regulator derived via a Lyapunov-based approach is proposed. The regulated state is uniformly bounded and it can enter and remain in a given arbitrarily small neighborhood of origin within a finite time interval. Author

N94-34323# Nanjing Aeronautical Inst. (China).
AUTO TUNING OF PID CONTROLLERS
You-Peng You and Hua-Jun Gong *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 62-66 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A new strategy for auto tuning of proportional - integral - derivative (PID) controllers is proposed in this paper. Two steps are involved in it: initial tuning and on-line updating. In the former step, PID parameters can be auto-tuned with good stabilities which is based on the step response of controlled process, avoiding the system self-oscillations. With the latter step, small changes are given to the initial tuned values during the system operation, which can improve the performance of the transient and steady behavior as well as the robustness of the system. The strategy is simple in algorithm and easy to be implemented by using microprocessors. Author

N94-34324# Harbin Inst. of Tech. (China).
PROCESS CONTROL USING NEURAL NETWORKS
Xiao-Ying Meng, Hua Zhang, Pe-Li Qiao, and Xing-Ru Sun *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 67-69 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

Artificial neural networks try to mimic the nerve system in a mammalian brain into a mathematical model. Therefore, neural networks have some desirable characteristics and capabilities similar to the brain system. This paper presents the principle of a feed-forward neural in process control systems. Author

N94-34325# Xiangtan Univ. (China). Dept. of Mechanical Engineering.
NTT CROSSCORRELATION RECURSIVE LEAST SQUARES PROCEDURE FOR ON-LINE IDENTIFICATION OF PROCESS PARAMETERS
Gan-Wen Zeng *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 70-73 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper introduces number thetetic transforms (NTT) into system COR-LS (cross correlation recursive least squares). It has started the method of transforming correlation functions of Wiener-Hopf equation in the time domain into one in whole number domain by NTT. The algorithm has characteristics of parallel calculation, and take only 2Nlog(base 2) N plus N, thus is suitable for 'on-line' system identification, because its calculation amount is much less than other current methods. Author (revised)

N94-34326# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
INTEGRATED FLIGHT/THRUST CONTROL SYSTEMS WITH CONSTANT ANGLE-OF-ATTACK **c08**
Yi-Dong Yang and Zhong Yang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 75-79 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The integrated flight/thrust control system with constant angle of attack, i.e. APCS (Approach Power Compensator System), can obviously raise an aircraft's performance of maneuver and make the flight path change in response to the attitude commands swift and accurate. Working principles of three APCS schemes, composition and effective parameters designing methods of their control laws are discussed in this study. The last two schemes presented by this paper, leading an attitude signal or an attitude command into the throttle, are the improved APCS's which make the general flight/thrust control systems better. This paper, which may be used as a theoretical instruction, is to present concrete methods to the design of current precision path guidance systems, especially of the APCS in the ACLD (Automatic Carrier Landing Systems). Author

N94-34327# Nanjing Aeronautical Inst. (China).
ROBUST VARIABLE STRUCTURE FLIGHT CONTROL SYSTEM **c08**
An-Hong Sun and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 80-84 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper develops a new robust variable structure system with the theory of robust control and variable structure control, and introduces it into the design of aircraft control systems. Because the variable structure system itself is robust for some parameter disturbances, so adopting the idea of robust control in the design of variable structure system has been of more significance. Numerical simulation shows that the result is good. Author

N94-34328# Nanjing Aeronautical Inst. (China).
AIRCRAFT OPTIMAL VARIABLE STRUCTURE CONTROL SYSTEM **c08**
An-Hong Sun and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 85-89 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper develops a new design method for aircraft control system, which is called 'optimal variable craft control system.' This system can make the aircraft keep good control performance in different space areas; it compensates the deficiency of the classical design of PID. Furthermore, because of that it can be realized easily in engineering, so it is a more practical and effective design method. Digital simulation shows that the result is good. Author

N94-34329# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE DECOUPLING DESIGN OF AIRCRAFT LATERAL FLIGHT CONTROL SYSTEMS WITH EIGENSTRUCTURE ASSIGNMENT **c08**
Shu-Fan Wu and Suo-Feng Guo *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 90-94 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A lateral stability augmentation and attitude pilot system for a Boeing-707 transport model is analyzed and designed with eigenstructure assignment method. The concepts and principles of eigenstructure assignment methods are first summarized. The extended aircraft lateral dynamics, including actuator dynamics and a washout filter on the yaw rate, is modeled as a multivariable time-invariant state equation, with seven state variables, two control inputs, and four measurement outputs. The desired (respective) eigenstructure are selected according to the requirements on the transient

performances and on the decoupling dynamics between roll and yaw maneuvering. Both the full output and the constrained output feedback strategies are used in the closed-loop system design. Digital simulation results are illustrated. Author

N94-34330# Nanjing Aeronautical Inst. (China).
H INFINITY OPTIMAL DESIGN OF ROBUST FLIGHT CONTROL SYSTEM **c08**
Chang-Sheng Jiang, Chun-Lin Shen, Chang-Yin Zhang, and Dai-Ye Lin *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 95-98 Sponsored by National Natural Science Foundation of China (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, a discussion is devoted to the H infinity optimal design problem of robust flight control system. This paper gives practical engineering design methods and procedures and develops corresponding design software package. In the meanwhile, it is illustrated by H infinity optimal design examples of flight control system that the design methods and procedures and software package are useful. Author

N94-34331# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE TRACKING CONTROL OF NONLINEAR UNCERTAIN SYSTEMS **c08**
Xiao Liu, Jin-Quan Huang, and Ju Jiang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 99-103 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The robust trajectory tracking control of a class of nonlinear uncertain systems is studied in this paper. It is assumed that there are uncertain variations in the systems parameters and unknown disturbance inputs acting on the system. The linearized nominal system is obtained by using feedback linearization technique. Then, a model-following structure based upon linear quadratic regulator theory is used to guarantee the linearized nominal system tracks the reference trajectory. Based on the Lyapunov stability theory, a nonlinear control law is derived such that the outputs of overall systems behaves as the closed-loop linearized nominal system. An example is presented to illustrate the approach. Author

N94-34332# Beijing Inst. of Tech. (China).
FAST ADAPTIVE CONTROL AND ITS APPLICATION TO MISSILE GUIDANCE **c08**
Ting-Li Kang and Zhi-Yong Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 104-109 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

For complicated controlled object such as missile guidance systems, the adaptive control algorithms became very sophisticated and the processing speed is a key problem. To speed up the computation of time-varying systems in which the parameters are usually described by time polynomials, this paper presents a new fast adaptive identification and control scheme. By means of autoregressive expansion of discrete time polynomial, the identification can be simplified to estimate coefficients of the highest power instead of every coefficients, so that the amount of computations at each sample period is reduced greatly. Meanwhile, through the parallel processing technique, the simplified algorithm is divided into two parts which can be executed concurrently to improve the control speed further. Finally, a simulation example of missile control which illustrates the efficiency of fast adaptive scheme is given. Author

N94-34333# Nanjing Aeronautical Inst. (China).
INTEGRATED CONTROL AND MANAGEMENT OF ADVANCED AIRCRAFT ELECTRICAL POWER SYSTEM **c33**
You-Ren Wang, Yang-Guang Yan, and Shi-Hong Lu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 110-114 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper studies the integrated control and management technology in airplane electrical power systems. The architectures of Advanced Aircraft Electrical Power System with Integrated Control and Management (AAEPSICM) are discussed. The concept of hierarchical distributed computer control which is applied in AAEPSICM is developed. The designs of system application software are considered. Functions and characteristics of the AAEPSICM's primary parts are analyzed in detail. Author

N94-34334# Air Force Missile Coll., Xian (China).
AN INTELLIGENT ON-LINE FAILURE-DIAGNOSIS CARD WITH EXTENSIVE USAGE **c38**
Jiz-Hang Liu, Xiao-Qin Xia, and Wen-Hui Lu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 115-116 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

It is always necessary to do failure diagnosis in measuring and repairing electronic products. Taking traditional methods is not only wasting time but also being inaccurate. So, we developed an intelligent on-line failure diagnosis card based on PC/XT and other high-grade microcomputers. The card can measure 24 channel voltages at the same time. It consists of two major parts. One is the hardware part and the other is the software part. The hardware part includes data collection device, data storage, control unit, and interface to microcomputer. The software part consists of the main program and many library procedures. When it is working, the microcomputer controls the data collection device through the control unit. The device can collect -15 V to +15 V scope voltage, send it to data storage, and then the microcomputer receives them. The main program analyzes and judges where failure is according to library procedures. The card has wide use, big measuring scope, and high accuracy. It has been used in measuring integrated circuits, circuit boards, and linear elements successfully. Author

N94-34335# Kitakyushu Coll. of Technology (Japan).
BILATERAL CONTROL TO COORDINATE OPERATORS WITH SUPPORTING SYSTEMS BY FORCE SENSED GRIPS **c37**
Mitsuru Soeda, Tadayoshi Furuya, and Tadashi Yamashita *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 117-121 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In handling objects effectively by bilateral master-slave arms, it is important that computer systems support the operators to coordinate both manual and automatic modes. Our previous study has shown that the operator can easily adjust the variable gain by the sensed force of gripping at the handlebar of master arm; that changes the gain of connection between the manual and automatic modes. In this paper, the method for bilateral control of master-slave teleoperation is studied to realize robustness and smoothness in controlling the slave-arms with the computer supporting systems. The sliding mode control is applied to the control system with variable gains by force-sensed grips. The parameters of the proposed method are examined through some simulations and some actual trials by using a master arm developed for this purpose. The method, proven by some examples of the master-slave movements in the one degree of freedom arm, realizes efficiencies in master-slave arm control with simplicities fo commands and flexibility of skilled human operators. Author

N94-34336# Hawaii Univ., Manoa, HI. Dept. of Electrical Engineering.
COMPUTER AIDED DESIGN OF ROBOTIC CONTROL SYSTEMS **c61**
H. H. Hwang and Alvin Louie *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 122-125 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The control system is the major part of a robotic system and therefore its design deserves special study. In this paper, the digital simulation

technique is used to design a continuous-time (or analog) system and the root-locus method is used to design a discrete-time (or digital) system according to desired performance specifications. The outlined computer aided design procedures and the developed computer softwares are useful for the design of dynamic systems. Author

N94-34337# Hankuk Aviation Univ., Kyunggido (Republic of Korea). Dept. of Aeronautical and Mechanical Engineering.
TRIM CALCULATION OF TANDEM ROTOR HELICOPTER USING SIMPLIFIED ROTOR SYSTEM MATHEMATICAL MODEL **c08**
Myoung-Shin Hwang and Kang-Woong Lee *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 126-130 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

To evaluate advanced research concepts relating to navigation, guidance, and control of a helicopter, a mathematical model is required. In this paper we describe a technique for determining the trims and quasistatic derivatives of a tandem rotor helicopter using a linear perturbation model with a simplified rotor system mathematical model. The results of this model show an acceptable agreement with referenced values. Author

N94-34338# Hankuk Aviation Univ., Kyunggido (Republic of Korea). Dept. of Mechanical Engineering and Design.
ADAPTIVE AUTOMATIC BALANCING OF MAGNETIC BEARING SYSTEMS **c37**
Jong-Sun Kim *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 131-135 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

Rotating machinery including magnetic bearings are usually persistently excited by the rotation related disturbances such as mass unbalance; hence there exists a residual vibration in the steady state response even if the closed loop system is asymptotically stable. In order to control the periodic disturbances, a disturbance accommodating controller (DAC) is designed based on the disturbance estimator and applied to the forced balancing of magnetic bearing system. The control objective is to minimize the synchronous component of shaft displacement or control current. In order to account for the variation of the disturbance model due to the shaft of operating speed, an adaptive disturbance accommodating control scheme is developed based on a certain optimality criterion. The continuous time design discretized to implement the controller in the digital computer and the merits and demerits are studied numerically. It is shown that the proposed method is efficient in reducing rotor unbalance and automatic balancing. Author

N94-34339# Taiyuan Univ. of Technology (China). Dept. of Automation.
EXPERT CONTROL VIA INEXACT REASONING
Zhong-Huai Zhang, Hui-Qing Yang, Ming-Zhi Jia, and Xiao-Mei Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 136-139 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, four kinds of inexact reasoning models such as subjective Bayesian method, determinacy theory, D-S evidence theory, and possibility theory are compared, which were offered in the expert system technique. For the characteristics of the real time control, an inexact reasoning model adopted in expert control is put forward, which is based on the combination of the subjective Bayesian method and determinacy theory. The basic algorithms of various certainties in the real time control are given. Practices prove that the expert control via inexact reasoning has better control performance. Author

N94-34340# Nanjing Aeronautical Inst. (China).
IMPROVEMENT OF CONTROL SYSTEM RELIABILITY WITH ANALYTICAL REDUNDANCY TECHNIQUE
Ji-Ling Xin and Qin-Si Fang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 140-145 (For primary document see N94-34308 10-63)
Avail: CASI HC A02/MF A03

The problem of improvement of digital control system reliability with analytical redundancy technique is studied by using computer simulation methods. The mathematic model of the studied engine is obtained by fitting the testing data of an engine with a segmental small deviation linearization method. It has state equation structure and its coefficient matrices A, B, C, and D are expressed as a function of control parameters. The sensor model is presented. Various failure models may be set. Separating Kalman filter is designed with extensive Kalman theory. It is used to detect and isolate the failed sensor of the control system. And the algorithm accommodates the state of system, through switch matrix sw. Simulation calculation shows that the designed system can detect hard and soft failures of a sensor, isolate, and accommodate them. The constructed analytical redundancy will operate instead of the failed sensor. Author

N94-34341# Southeast Univ., Nanjing (China). Dept. of Instrument Science and Engineering.
A TEST SYSTEM OF POSE REPEATABILITY PRECISION OF MULTI-PATH ROBOT **c37**
Wei-Gong Zhang and Yu-Jian Zhai *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 146-149 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, a new test system is presented which is used to measure the pose repeatability precision of robot. The system is composed of a triangular pyramid test-block, which is held by a manipulator, and a measurement equipment on which transducers are assembled. When measurement is demanded, the manipulator holds the block, goes into the region to be measured, and contacts with the transducers. According to the algorithms given in this paper, the pose of the block may be calculated from the transducers output values, and the repeatability precision parameters may also be obtained through several times of calculations. Because of transducers used in the measurements are assembled on a plane foundation support, the path of the block is not restrained by the measurement mechanism when it goes into the measurement region, and the multi-path repeatability precision may be tested. Through error analysis and optimal design, an error simulation is carried out in this paper. It is shown that the system has the advantages of high accuracy and easy assembly. It may be used in industrial sites, with a practical significance in robot studies and applications. Author

N94-34342# Harbin Inst. of Tech. (China).
APPLICATION OF MICROCOMPUTER GOVERNED SPEED RISE AND LOADCONTROL APPLIANCE IN THE 200MW STEAM TURBINE
Dao-Yi Ye, Yong-Bin Yang, and Shu-Min Liu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 150-153 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The paper introduces one of the steam turbine microcomputer control systems (TMC). One feature is that it kept all of the original hydraulic system. The control signal from microcomputer is led into the steam turbine by a stepping motor driven synchronizer. The paper discusses the control principle of the 200 MW steam turbine start up procedure and TMC function and also describes the hardware and software of the appliance.
Author (revised)

N94-34343# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control.
THE DESIGN AND REALIZATION OF A REAL-TIME MULTITASKING CONTROL SYSTEM BY USING AMX MULTITASKING EXECUTIVE
Pei-Yi Niu and Wen-Ming Geng *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 154-159 (For primary document see N94-34308 10-63)
Avail: CASI HC A02/MF A03

A real-time system is characterized by the need to respond rapidly to events occurring synchronously in time. A multitasking system is one in which a number of activities or processes must be performed simultaneously without interference with each other. A system in which several activities must operate simultaneously with time-critical precision is called a real-time multitasking system. The control system to be discussed in this paper is just such a real-time multitasking system which is used in cigarette making factories to feed cut tobacco into cigarette machines. A microcomputer is used as the controller in the system with DOS embedded in it. As all we know, DOS is a non-real-time, single task operating system. It is very difficult to implement real-time multitasking executive functions in DOS environment. The AMX Multitasking Executive provides a simple solution to the complexity of real-time multitasking. It primes the orderly execution of a set of application program modules called tasks, while each task solves a particular problem and provides a specific functional capability within the system. The most difficult and time consuming procedures in applying AMX to a concrete control system is how to separate the system's functions into tasks and organize them logically. First in this paper, several important concepts about AMX is introduced. Then the tobacco feeding system and its functions are described. The whole design and realization process is presented in detail, without intention to demonstrate the usage of AMX. Particularly, comparisons with the real-time multitasking software the advantages and disadvantages of AMX. It has been shown that AMX is very easy to use, just with the cost of larger size of memory and a little slower speed. Author

N94-34344# Harbin Inst. of Tech. (China).
APPLICATION OF PROGRAMMABLE LOGIC CONTROLLER TO PUMP REGULATION SYSTEM FOR SUPPLYING WATER **c37**
Dao-Yi Ye, Yong-Bin Yang, and Zong-Qi Lu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 160-163 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper describes a pump regulation system for supplying-water. The controlled variable is the output water pressure for supplying-water pumps. The reference input signal is given in PLC. The water pressure for supplying-water pump output is fed back by a A/D converter to CPU in PLC. The output of Programmable Logic Controller Controls a frequency converter. The frequency converter controls three groups of motor-pump. The water from the three pumps enters the same pipe. Programmable Logic Controller (PLC) uses Ladder-shaped diagram software to implement logical control and proportional-plus-integral control. The method for automatic tuning of regulator of the PID type is based on a simple identification method which gives one point on the Nyquist curve of the open loop transfer function. The key idea is a scheme which provides automatic excitation of the process which is nearly optimal for estimating the desired process characteristics. Only a frequency converter controls several groups of motor pumps, therefore, the cost of the system is decreased. This system has electrically breaking off protection function and automatically restoring software. Through a long time operation, the system can work well. Author

N94-34345# Kunming Inst. of Tech. (China). Dept. of Automation.
MODELLING AND OPTIMAL CONTROL OF Pb-Sn CONTINUOUS CRYSTALLIZATION PROCESS **c75**
Xiang-Zhen Zeng and Xiao-Ming Jin *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 164-168 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The electric-heating continuous crystallizer is an important piece of equipment in the tin metallurgic process. In terms of thermodynamics and metallurgic dynamics, we discussed the influence of its matter and energy factors on the production quality and quantity in the crystallization process. The proposed steady mathematical model had been verified in the industrial background, which was developed with system simplification and relation analysis techniques. Based on the steady model, we created an integrative benefit function and determined the steady optimization control strategy. Simulation results show that the algorithm is practical. The study not only lead the research from qualitative analysis to quantitative analysis and synthesis, but also layed a theoretical foundation for equipment automation. Author

N94-34346# Kunming Inst. of Tech. (China). Dept. of Automation.
A DYNAMIC MODEL OF THE VACUUM FURNACE FOR SEPARATING Pb FROM Sn-Pb ALLOY **c26**
Xiang-Zhen Zeng and Li-Hui Feng *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 169-172 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The furnace for vacuum distillation separating Pb from Sn-Pb has been operating for many years and has become an important equipment in the tin and lead metallurgical industry. In this article, as a study plant with the vacuum furnace, we built up a dynamic model of the separating process by a mechanical modeling methodology. The model is multi-input and multi-output, nonlinear differential equations and holds out the inner characters of the vacuum furnace. To compare simulated results with sampling values of record data in operating process for a long time, it has been shown that the model is very accurate and dependable. Author

N94-34347# Tsinghua Univ., Bejing (China). Dept. of Precision Instruments.
APPLICATION OF NEURAL NETWORKS IN MULTIPLE SENSOR FUSION FOR ON-LINE TOOL WEAR MONITORING
Kui Jia, Li Zheng, Zhen-Bi Luo, and Bo-Peng Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 173-177 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In recent years, high quality and productivity have become more and more important for Intelligent Manufacturing System (IMS). The on-line monitoring of tool condition is one of the key component in modern manufacturing. Traditional approach for tool wear monitoring is to use a single sensor signal to monitor the process. In many cases, this approach is inadequate due to inaccurate sensor information and the lack of a single process model which can sufficiently reflect the complexity of the process. In this paper, a new multiple sensor fusion approach based on features is presented, and neural networks are used to integrate information from multiple sensors (acoustic emission sensor and power/current sensor) and machining conditions. A neural network monitor based on a feedforward backpropagation algorithm is developed and a prototype scheme for on-line monitoring is implemented. Different kinds of experiments have proved that the fusion model using neural networks can achieve a high success rate for tool wear monitoring under varying machining conditions. The results also show that a neural network is superior in achieving information fusion for on-line monitoring of tool condition and enhancing the predication accuracy and the ability of noise suppression. Author

N94-34348# Nanjing Aeronautical Inst. (China).
OPTIMUM DESIGN OF WIDE FREQUENCY VIBRATION ABSORBERS **c39**
Xiao-Zhong Song, Zhen-Qiu Zhou, and Jie Wu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 182-186 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A nondimensional vibration parameters expression is presented which is suitable for design of vibration absorbers. Compared with the single-degree-of-freedom system, the results show that the numerical analyses in parameter design are made to wide frequency vibration absorbers. As the construction of objective function is complex, its partial derivation is not easy to get, and the non-optimum parameters is a variable in wide frequency, one optimum design program is presented which can obtain the ideal results in wide frequency absorber design. The optimum design program for wide frequency vibration absorbers in this paper can be applied in all kinds of vibration absorber design. Author (revised)

N94-34349# Nanjing Aeronautical Inst. (China). Research Inst. of Vibration Engineering.
STUDY ON ACTIVE CONTROL OF WAVEGUIDE WITH PIEZOCERAMIC ACTUATOR **c33**
Ping Tan and Chun-Sheng Zhao *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 187-189 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

According to travelling wave model, authors deduce an active control law and its compensator formation of one dimensional flexural waveguide which is about one point measurement and one excitation with the piezoceramic actuator. Author

N94-34350# China Univ. of Mining and Technology.
TIME DELAY MEASUREMENT CORRELATOR AND ITS APPLICATION **c33**
Yuan-Qing Fang and Fan-Qin Meng *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 190-192 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper introduces the design principle of a time delay measurement correlator and its implementation methods by digital circuit and single chip microprocessor. With correlator designed, the highest sample frequency is 11.7 KHz, the least delay resolution is 85 microseconds. A time delay measurement system for flow velocity of a gas/solid two phase flow is one of its applications. Experiments have proven that this system can meet the demands of real-time velocity measurements. Author (revised)

N94-34351# Chongqing Univ. (China). Inst. of Mechanical Engineering.
SOLID STATE ACOUSTICS INFORMATION TIME REGION SEPARATING METHODS FOR GEAR DIAGNOSIS OF FAILURES **c38**
Cheng-Bo Yu, De-Pei Liang, and Cheng Yang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 193-197 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This article introduces a new method of the characteristics extracting from gear failures information-time region separating methods (TRSM). There are mashing frequency compositions of extracting, reflecting uniform failures methods by moving average and axle frequency composition of extracting reflecting partial failures methods by detection filter. So that it causes the signal-to-noise ratio and the accuracy judging gear state of movement to raise a quantity class. The conclusions are verified by experimental testing. Author

N94-34352# Nanjing Univ. (China). Inst. of Science and Technology.
HIGH ACCURACY APPROXIMATION OF OFFSET CURVES WITH RATIONAL GEOMETRIC SPLINES **c61**
Yan-Chun Wang and Yong-Jun Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 198-201 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

For approximating offset curves precisely, a simple construction of the cubic rational geometric splines is proposed, obtained by patching together rational parametric cubic segments. The scheme is strictly local and has geometric continuity of the order of 2 (G sup 2 continuity or GC sup 2), and the parameters of which can be properly chosen to get approximation accuracy of the order of 6 if the interpolated curves are sufficiently smooth and have nonvanishing curvatures. Some examples of the application of the scheme are presented. Author

N94-34353# Hong Kong Polytechnic, Kowloon. Dept. of Manufacturing Engineering.
DIMENSIONAL MEASUREMENT TO SUBPIXEL VALUE **c61**
Paul S. Wu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 203-206 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In digital image processing and feature extraction procedures, one is often required to locate edges for dimensional measurements. In many machine vision applications, these dimensional values must be obtained in the presence of noise, in a high speed operation, and with a sufficient precision to a subpixel resolution. Many edge detection methods have been proposed over the years. Some methods are aimed for location measurement with a pixel accuracy. These methods are generally not suitable to provide a subpixel location accuracy without some types of interpolation process and a reduction of throughput. Other methods are aimed for high speed operations. These methods are generally simple, sensitive to system noise, and producing inconsistent results in the real environment. Still other methods are aimed for high accuracy even under practical conditions. These methods are generally very calculation intensive and are not suitable for high throughput operations. The balance between speed and accuracy of an approach is a continuous challenge to system engineers. In addition, the resulting performance of an approach, usually, can only be measured, not predicted in a real operational environment. This paper examines a application motivated method in an attempt to solve the problem. An edge fitting approach is used for a real time, high speed, 100 percent product inspection system which requires critical high precision dimensional measurements. Comparisons between this approach and other methods using either interpolation or non-interpolation process are presented. The results are most favorable. Author

N94-34354# Nanjing Aeronautical Inst. (China).
THREE DIMENSIONAL ICs INTELLIGENT SENSORS **c35**
Hou-Shu Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 207-210 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The need for modern measurement and control technology arise together with the rapid development of the technology for mass-produced sensors. It is found that silicon is an important substrate material for integrated circuits (IC's) as well as sensing elements, because sensing elements and associated signal processing IC's can be fabricated on one chip constructing IC intelligent sensors. This paper briefly introduces silicon's physical transduction effects suitable for fabrication of sensors, advantages of on-chip ICs, and 3-D IC intelligent sensors. Author (revised)

N94-34355# Nanjing Aeronautical Inst. (China). Dept. of Test and Measurement Engineering.
A REAL-TIME 2-D COMPOSITE DAMAGE MONITORING SYSTEM EMPLOYING NEURAL NETWORK **c39**
Yun-Gang Tao, Bao-Qi Tao, and Shen-Lin Yu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 211-215 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper introduces the research work we have done on a real-time 2-D composite damage monitoring system employing neural network. The system can detect the damage position, the large strain in the structure, and then, according to the detective result, change the structure strength automatically. The artificial neural networks used the Kohonen Self-Organizing Maps (SOM). Its output is used to control and actuate the Shape Memory Alloy (SMA), and the damage location is display on the screen of AST386 computer. The experiment results have shown that the system is available. Author

N94-34356# Nanjing Aeronautical Inst. (China). Test and Measurement Centre.
THE MEASUREMENT AND THREE DIMENSIONAL RECONSTRUCTION FOR CONFIGURATION OF AIR VEHICLE USING IMAGE PROCESSING TECHNIQUES **c05**
Ying-En Xiong, Xin Qiao, and De-Zong Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993),

Volume 10, No. 1 1993 p 216-219 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A new method of the measurement and three dimensional reconstruction for air vehicle configuration using image processing techniques is presented. Two parts are included in this method. The first part included following. Two or more photographs are taken using ordinary camera. These photographs are inputted in digital image processing system. After some necessary processing, the coordinates of suitable points for every image are achieved and the three dimensional information is gained. According to this three dimensional information, the three dimensional coordinates of the configuration of air vehicle are solved. The second part includes following. More coordinates of points of the air vehicle configuration are solved by mathematical method using the points gained above. The grid drawing of the air vehicle configuration is achieved by fitting these points. At last, the three dimensional stereo image of the air vehicle configuration is set up by using the surface information of air vehicle and certain lighting conditions. So, the reconstruction for air vehicle configuration is reached. Through practical application, it is expressed that the air vehicle configuration can be obtained using this method. The computer program system made up in this paper has many advantages. It can be applied not only for the measurement and three dimensional reconstruction of air vehicle configuration, but also for other objects. It has practical applications for aeronatics, astronautics, computer vision, and intelligent system. Author

N94-34357# Nanjing Aeronautical Inst. (China).
THE APPLICATION OF THE BI-PHASE CODING IN THE SERIAL TRANSFER **c61**
Shen-Ling Yu and Jun Zhou *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 220-222 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

It's known that Bi-phase coding is used in serial communications; however, this coding scheme is not widely used. In this paper, we discuss the method of 'whole-wave sampling,' which makes use of Bi-phase coding. Author (revised)

N94-34358# Nanjing Aeronautical Inst. (China).
THE MEASUREMENT OF THREE-DIMENSIONAL GEOMETRIC PARAMETER **c35**
Ming Li and De-Zong Wang *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 227-231 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A special image test method to measure three-dimensional geometric parameters is introduced in this paper. These parameters can be measured using only one photograph taken by a single camera. The test system includes the development of a light source, image pretreatment, image recognition, and image measurement. Author (revised)

N94-34359# Yantai Univ. (China).
MEASUREMENTS OF THE SIS: MAGNETS AND SIS CONTROL SYSTEM **c37**
You-Lun Qin *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 232-236 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

In this paper, we will discuss the magnetic measurements that were made on the heavy ion synchrotron's (SIS) main magnet and control systems. The objectives of the measurements are to check the magnets for possible field errors and to verify that they fulfill the design requirements. The SIS control system was described in terms of its system structure, networking, equipment control systems, and timing system. Block diagrams are given for MAGLAB--a data aquisition system for magnetic measurements--and for the timing and equipment control for the SIS. Author (revised)

N94-34360# Nanjing Aeronautical Inst. (China).
A METHOD AVAILABLE FOR PROCESSING THE SIGNAL OF THERMOCOUPLES BY COMPUTER **c35**
Wen-Qing Han *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 237-240 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper presents a method of polynomial fitting in sections. It's available for microcomputer processing. By using this method, the polynomial regression equations of the reference tables of 9 kinds of IEC standarized thermocouples and 19 kinds of nonstandard thermocouples are obtained. The maximum error is less than 0.3 C. The group of equations are available for processing the thermocouple signals and controlling the temperature in real-time. They are more concise and accurate than the conventional equations. The processing program is also described. Author (revised)

N94-34361# Nanjing Aeronautical Inst. (China). Dept. of Measurements and Instrumentation Engineering.
A DISTRIBUTED OPTICAL FIBER STRAIN SENSOR FOR MONITORING STRUCTURAL DEFORMATIONS **c35**
Fei Luo and Zhi-He Wu *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 241-243 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

Distributed, optical fiber sensing techniques can be applied to the real-time monitoring and damage detection of large and important engineering structures. In this paper, a distributed optical fiber strain sensor using the optical time domain reflectometry technique is presented. The distributed longitudinal strain, along a sensing fiber, caused by structural deformations can be measured by detecting the Rayleigh backscattered light signal from the fiber. Author (revised)

N94-34362# China Univ. of Mining and Technology.
A MICROCOMPUTER MEASURING-CONTROLLING SYSTEM FOR THE PERFORMANCE TEST OF FOGGING NOZZLES **c31**
Jun Cheng, Ming-Xing Ling, Ren-Zhi Wu, Qing Rui, and Yong-Zhong Zhang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 244-248 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The fogging nozzle is a key part for secondary cooling in continuous casting. Its performance exerts a tremendous influence on the quality of the casting block. This paper introduces a microcomputer measuring-controlling system for the performance testing of fogging nozzles. In order to measure the evenness of the water volume distribution, a new type of capacity transducer was developed by authors. Author (revised)

N94-34363# Jiangsu Inst. of Tech., Zhenjiang (China). Dept. of Computer Engineering.
A PC-BASED MEASUREMENT AND TEST SYSTEM FOR DIGITAL CONTROLLER **c61**
Jian-Wen Huang, Zou-Jue Chen, Wai-Ping Dai, Ning Wang, and Chang Hu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 249-252 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper presents a PC-based test system for digital controllers, the Digital Controller Tester. It has been used in Dafang Digital Control Company. The Tester can be used as a digital multimeter or as an emulator to execute measuring and testing processes. The Tester uses several effective digital processing techniques. Author (revised)

N94-34364# Jiangsu Inst. of Tech., Zhenjiang (China). Dept. of Computer Engineering.
DIGITAL CIRCUIT TEST LANGUAGE AND TEST PATTERN DATA BASE **c33**
Tie-Jun Xiao, Xin-Rong Chen, Xue-Ying Ma, and Jian-Wen Huang *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on

Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 253-255 Prepared in cooperation with Academia Sinica, Nanjing, China (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The paper presents two aspects of digital integrated circuit testing. For test pattern generation, a set of instructions of a test language were designed and implemented. Their functions are described. For generated test pattern storing, a database and its management system were designed and implemented. Its data structure and organization are discussed.
Author (revised)

N94-34365# Nanjing Aeronautical Inst. (China).
A NEW TYPE OF TEMPERATURE AND HUMIDITY DETECTION-CONTROL SYSTEM **c35**
Lian-Bo Jiao and Shu-Hui Lou *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 256-259 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper introduces a new type of intelligent multichannel system for the detection and control of temperature and humidity. In this paper, the integration of the hardware with the software is discussed. Additionally, the function of the single-chip microcomputer (microcontroller) is described fully.
Author (revised)

N94-34366# Nanjing Aeronautical Inst. (China). Dept. of Mechanical Engineering.
COMPUTER IMAGE ANALYSIS OF WEAR DEBRIS WITH ITS APPLICATIONS TO MACHINE WEAR DIAGNOSIS **c37**
Hong-Fu Zuo, Jing-Lan Zhan, Bao-Chen Li, and Gui-Chun Tao *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 260-264 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The ferrographic technique is a quasi-quantitative method which is widely used in the wear diagnosis of machines. In this paper, an improved ferrographic technique that makes use of a microcomputer image processing system and image analysis techniques was used to quantitatively realize the parameters of wear debris. The debris was sampled under several wear conditions. The Weibull function was applied to fit the actual distribution of size and roundness. It was shown that the transition region of the wear states can be predicted by a test of the mean and variance of the debris size distribution. Additionally, it was shown that the wear mode in certain mechanisms can be diagnosed by the identification and the classification of debris according to its roundness, lenth ratio of major to minor, concavity, dispersion, linearity, etc.
Author (revised)

N94-34367# Nanjing Aeronautical Inst. (China). Dept. of Testing and Measurement Engineering.
PRELIMINARY STUDY OF MEASURING FATIGUE THRESHOLD WITH THE CONTROL OF COMPUTER **c39**
Ke-Yin Zhou, Yong-Duan Wu, and Yong-Shang Yi *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 265-267 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The fatigue threshold delta(K(sub th)) is an important factor to estimate the character of materials. In the study of new materials and new technology, researchers pay great attention to the difference of the threshold of every parameter rather than the precise thresholds. A method of measuring the fatigue threshold with a Bezier curve is proposed in this paper. The evaluation results prove that the train of thought is reliable, and the precision meets the needs of the selected parameters.
Author (revised)

N94-34368# Anhui Inst. of Optics and Fine Mechanics, Hefei (China).
COMPUTER ASSISTANT TEST AND CONSULTIVE SYSTEM FOR AIRCRAFT FLUID ELEMENT **c34**
Jin-Ru Liu *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 268-270 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

The fluid bearing elements of an aircraft's control system are discussed in the context of aviation maintenance engineering. This paper explores the development of an artificially intelligent assistant to aid in the maintenance of hydraulic control systems.
Author (revised)

N94-34369# Ufa State Technical Aviation Univ. (Russia)
THE MODELLING OF THE OCEAN SURFACE IMAGE IN OPTICAL REMOTE SENSING **c43**
S. T. Kusimov, B. G. Ilyasov, V. H. Bagmanov, and A. H. Sultanov *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 271-274 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

A modelling technique is developed for the simulation of ocean surface images in the diverse conditions that exist in optical remote sensing. The computer aided synthesis of the images is based on the physical laws of skylight radiation reflection by a random surface. The ocean surface is modelled as a random field with definite correlation properties determined by two-dimensional wave number spectrum.
Author (revised)

N94-34370# Nanjing Aeronautical Inst. (China). Dept. of Automatic Control Engineering.
NOMINAL H(EXP 2)-OPTIMIZATION AND STRONG STABILIZATION: A PRACTICAL EXAMPLE OF U-PARAMETERIZATION DESIGN
Yang Wei and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 276-280 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper is concerned with the problem of finding a controller for a feedback control system which minimizes an H(sub 2)-norm of a weighted sensitivity function. The solution to this problem consists of two steps: (1) showing that the Youla strong stabilization (stabilization with stable controllers) approach, using sensitivity functions, can lead to a unit interpolation problem; and (2) using a free strongly bounded real function, the U-parameter in this case, to study the problem of designing an H(sub 2)-optimal stable controller for a scalar system. Additionally, we propose that the free parameter be applied to a practical flight control system design for wind-shear protection, where data is used from the Eastern airlines flight 66 which crashed at J. F. Kennedy International airport. It is shown that the resultant flight control system can make an aircraft successfully land in no wind-shear (stable dynamics) and wind-shear (unstable dynamics) conditions.
Author (revised)

N94-34371# Nanjing Aeronautical Inst. (China).
A NEW ROBUST ADAPTIVE ALGORITHM BASED ON INTELLIGENT INTEGRATORS
Da-Zhang Liao and Chun-Lin Shen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 281-285 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

This paper presents a new adaptive algorithm to improve the robustness of MRAS systems. If there is a sinusoidal disturbance in the adaptive control system or the sinusoidal signal in the reference input, the gain of the adaptive operator increases without bound. This is due to the multipliers and integrators (which are necessary) inside the adaptive loop. Further, the system becomes unstable if the plant has unmodelled dynamics. In this paper, the intelligent integrator is substituted for the pure integrator to eliminate the infinite-gain operator and to improve the robustness. The example in the paper shows that some adaptive systems that are unstable using existing adaptive algorithms can perform well using the new one.
Author (revised)

N94-34372# Nanjing Aeronautical Inst. (China). Dept. of Mechanical Engineering.
A STUDY ON ADAPTIVE ACTIVE NOISE CONTROL **c71**

W. M. Wu, N. L. Tan, H. Ren, and S. L. Chen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 286-290 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

Active noise control (ANC) is an effective technique to decrease acoustical noise, particularly at low frequencies where traditional passive techniques are expensive and inefficient. Adaptive active noise control (AANC), which makes use of numerical techniques, solves some problems more efficiently. This paper presents a simple and direct, but effective, algorithm for an AANC system, and it describes an AANC system based on the algorithm. The algorithms for the system were implemented on a digital signal processing board with the DSP-chip TMS320C25. The system can attenuate pure tone, repetitive noise and random noise in real-time.
Author (revised)

N94-35043*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE 1994 GODDARD CONFERENCE ON SPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE
Carl F. Hostetter, ed. Washington May 1994 359 p Conference held in Greenbelt, MD, 10-12 May 1994
(RTOP 510-00-00)
(NASA-CP-3268; Rept-92B00066; NAS 1.55:3268) Avail: CASI HC A16/MF A03

This publication comprises the papers presented at the 1994 Goddard Conference on Space Applications of Artificial Intelligence held at the NASA/GSFC, Greenbelt, Maryland, on 10-12 May 1994. The purpose of this annual conference is to provide a forum in which current research and development directed at space applications of artificial intelligence can be presented and discussed. For individual titles, see N94-35044 through N94-35072.

N94-35044*# International Business Machines Corp., Yorktown Heights, NY.
INTERACTIVE ARCHIVES OF SCIENTIFIC DATA **c82**
Lloyd A. Treinish *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 3-15 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

A focus on qualitative methods of presenting data shows that visualization provides a mechanism for browsing independent of the source of data and is an effective alternative to traditional image-based browsing of image data. To be generally applicable, such visualization methods, however, must be based upon an underlying data model with support for a broad class of data types and structures. Interactive, near-real-time browsing for data sets of interesting size today requires a browse server of considerable power. A symmetric multi-processor with very high internal and external bandwidth demonstrates the feasibility of this concept. Although this technology is likely to be available on the desktop within a few years, the increase in the size and complexity of achieved data will continue to exceed the capacity of 'worksation' systems. Hence, a higher class of performance, especially in bandwidth, will generally be required for on-demand browsing. A few experiments with differing digital compression techniques indicates that a MPEG-1 implementation within the context of a high-performance browse server (i.e., parallized) is a practical method of converting a browse product to a form suitable for network or CD-ROM distribution.
Author

N94-35045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PLANNING APPLICATIONS IN IMAGE ANALYSIS **c82**
Mark Boddy (Honeywell, Inc., Minneapolis, MN.), Jim White (Honeywell, Inc., Minneapolis, MN.), Robert Goldman (Honeywell, Inc., Minneapolis, MN.), and Nick Short, Jr. *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 17-28 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

We describe two interim results from an ongoing effort to automate the acquisition, analysis, archiving, and distribution of satellite earth science data. Both results are applications of Artificial Intelligence planning research to the automatic generation of processing steps for image analysis tasks. First, we have constructed a linear conditional planner (CPed), used to generate conditional processing plans. Second, we have extended an existing hierarchical planning system to make use of durations, resources, and deadlines, thus supporting the automatic generation of processing steps in time and resource-constrained environments.
Author

N94-35046*# Lockheed Missiles and Space Co., Palo Alto, CA.
RAVE: RAPID VISUALIZATION ENVIRONMENT **c82**
D. M. Klumpar, Kevin Anderson, and Avangelos Simoudis *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 29-38 (For primary document see N94-35043 10-63)
Avail: CASI HC A02/MF A03

Visualization is used in the process of analyzing large, multidimensional data sets. However, the selection and creation of visualizations that are appropriate for the characteristics of a particular data set and the satisfaction of the analyst's goals is difficult. The process consists of three tasks that are performed iteratively: generate, test, and refine. The performance of these tasks requires the utilization of several types of domain knowledge that data analysts do not often have. Existing visualization systems and frameworks do not adequately support the performance of these tasks. In this paper we present the RApid Visualization Environment (RAVE), a knowledge-based system that interfaces with commercial visualization frameworks and assists a data analyst in quickly and easily generating, testing, and refining visualizations. RAVE was used for the visualization of in situ measurement data captured by spacecraft.
Author (revised)

N94-35047*# Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Information Technology.
ON-BOARD EMERGENT SCHEDULING OF AUTONOMOUS SPACECRAFT PAYLOAD OPERATIONS
Craig A. Lindley *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 41-55 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

This paper describes a behavioral competency level concerned with emergent scheduling of spacecraft payload operations. The level is part of a multi-level subsumption architecture model for autonomous spacecraft, and it functions as an action selection system for processing a spacecraft commands that can be considered as 'plans-as-communication'. Several versions of the selection mechanism are described, and their robustness is qualitatively compared.
Author (revised)

N94-35048*# Space Telescope Science Inst., Baltimore, MD.
A CRITERION AUTOSCHEDULER FOR LONG RANGE PLANNING
Jeffrey L. Sponsler *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 57-71 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

A constraint-based scheduling system called SPIKE is used to create long-term schedules for the Hubble Space Telescope. A meta-level scheduler called the Criterion Autoscheduler for Long range planning (CASL) was created to guide SPIKE's schedule generation according to the agenda of the planning scientists. It is proposed that sufficient flexibility exists in a schedule to allow high level planning heuristics to be applied without adversely affected crucial constraints such as spacecraft efficiency. This hypothesis is supported by test data which is described.
Author (revised)

N94-35049*# Space Telescope Science Inst., Baltimore, MD.
PROPAGATING ORIENTATION CONSTRAINTS FOR THE HUBBLE SPACE TELESCOPE **c89**
Ashim Bose and Andy Gerb *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 73-86 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

An observing program on the Hubble Space Telescope (HST) is described in terms of exposures that are obtained by one or more of the instruments onboard the HST. Many requested exposures might specify orientation requirements and accompanying ranges. Orientation refers to the amount of roll (in degrees) about the line of sight. The range give the

permissible tolerance (also in degrees). These requirements may be (1) absolute (in relation to the celestial coordinate system), (2) relative to the nominal roll angle for HST during that exposure, or (3) relative (in relation to other exposures in the observing program). The TRANSformation expert system converts proposals for astronomical observations with HST into detailed observing plans. Part of the conversion involves grouping exposures into higher level structures based on exposure characteristics. Exposures constrained to be at different orientations cannot be grouped together. Because relative orientation requirements cause implicit constraints, orientation constraints have to be propagated. TRANS must also identify any inconsistencies that may exist so they can be corrected. We have designed and implemented an orientation constraint propagator as part of TRANS. The propagator is based on an informal algebra that facilitates the setting up and propagation of the orientation constraints. The constraint propagator generates constraints between directly related exposures, and propagates derived constraints between exposures that are related indirectly. It provides facilities for path-consistency checking, identification of unsatisfiable constraints, and querying of orientation relationships. The system has been successfully operational as part of TRANS for over seven months. The solution has particular significance to space applications in which satellite/telescope pointing and attitude are constrained and relationships exist between multiple configurations. Author

N94-35050*# Colorado Univ., Denver, CO. Dept. of Computer Science and Engineering.

A LINGUISTIC GEOMETRY FOR SPACE APPLICATIONS

Boris Stilman *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 87-101 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

We develop a formal theory, the so-called Linguistic Geometry, in order to discover the inner properties of human expert heuristics, which were successful in a certain class of complex control systems, and apply them to different systems. This research relies on the formalization of search heuristics of high-skilled human experts which allow for the decomposition of complex system into the hierarchy of subsystems, and thus solve intractable problems reducing the search. The hierarchy of subsystems is represented as a hierarchy of formal attribute languages. This paper includes a formal survey of the Linguistic Geometry, and new example of a solution of optimization problem for the space robotic vehicles. This example includes actual generation of the hierarchy of languages, some details of trajectory generation and demonstrates the drastic reduction of search in comparison with conventional search algorithms. Author

N94-35051*# Drexel Univ., Philadelphia, PA. IMPAQT Center.

MULTIRESOLUTIONAL SCHEMATA FOR UNSUPERVISED LEARNING OF AUTONOMOUS ROBOTS FOR 3D SPACE OPERATION

Alberto Lacaze, Michael Meystel, and Alex Meystel *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 103-112 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

This paper describes a novel approach to the development of a learning control system for autonomous space robot (ASR) which presents the ASR as a 'baby' -- that is, a system with no a priori knowledge of the world in which it operates, but with behavior acquisition techniques that allows it to build this knowledge from the experiences of actions within a particular environment (we will call it an Astro-baby). The learning techniques are rooted in the recursive algorithm for inductive generation of nested schemata molded from processes of early cognitive development in humans. The algorithm extracts data from the environment and by means of correlation and abduction, it creates schemata that are used for control. This system is robust enough to deal with a constantly changing environment because such changes provoke the creation of new schemata by generalizing from experiences, while still maintaining minimal computational complexity, thanks to the system's multiresolutional nature. Author

N94-35052*# Martin Marietta Corp., Moorestown, NJ.

A GENETIC TECHNIQUE FOR PLANNING A CONTROL SEQUENCE TO NAVIGATE THE STATE SPACE WITH A QUASI-MINIMUM-COST OUTPUT TRAJECTORY FOR A NON-LINEAR MULTI-DIMNENSIONAL SYSTEM

C. Hein and A. Meystel *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 113-120 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

There are many multi-stage optimization problems that are not easily solved through any known direct method when the stages are coupled. For instance, we have investigated the problem of planning a vehicle's control sequence to negotiate obstacles and reach a goal in minimum time. The vehicle has a known mass, and the controlling forces have finite limits. We have developed a technique that finds admissible control trajectories which tend to minimize the vehicle's transit time through the obstacle field. The immediate applications is that of a space robot which must rapidly traverse around 2-or-3 dimensional structures via application of a rotating thruster or non-rotating on-off for such vehicles is located at the Marshall Space Flight Center in Huntsville Alabama. However, it appears that the development method is applicable to a general set of optimization problems in which the cost function and the multi-dimensional multi-state system can be any nonlinear functions, which are continuous in the operating regions. Other applications included the planning of optimal navigation pathways through a transversability graph; the planning of control input for under-water maneuvering vehicles which have complex control state-space relationships; the planning of control sequences for milling and manufacturing robots; the planning of control and trajectories for automated delivery vehicles; and the optimization and athletic training in slalom sports. Author

N94-35053*# Old Dominion Univ., Norfolk, VA.

MODELING HETEROGENEOUS PROCESSOR SCHEDULING FOR REAL TIME SYSTEMS

J. F. Leathrum, R. R. Mielke, and J. W. Stoughton *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 121-133 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

A new model is presented to describe dataflow algorithms implemented in a multiprocessing system. Called the resource/data flow graph (RDFG), the model explicitly represents cyclo-static processor schedules as circuits of processor arcs which reflect the order that processors execute graph nodes. The model also allows the guarantee of meeting hard real-time deadlines. When unfolded, the model identifies statically the processor schedule. The model therefore is useful for determining the throughput and latency of systems with heterogeneous processors. The applicability of the model is demonstrated using a space surveillance algorithm. Author

N94-35054*# Allied-Signal Aerospace Co., Seabrook, MD.

C++ PLANNING AND RESOURCE REASONING (PARR) SHELL

James McIntyre, Alan Tuchman, David McLean, and Ronald Littlefield *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 135-146 (For primary document see N94-35043 10-63)

(Contract NAS5-27772)

Avail: CASI HC A03/MF A03

This paper describes a generic, C++ version of the Planning and Resource Reasoning (PARR) shell which has been developed to supersede the C-based versions of PARR that are currently used to support AI planning and scheduling applications in flight operations centers at Goddard Space Flight Center. This new object-oriented version of PARR can be more easily customized to build a variety of planning and scheduling applications, and C++ PARR applications can be more easily ported to different environments. Genetic classes, constraints, strategies, and paradigms are described along with two types of PARR interfaces. Author

N94-35055*# Pennsylvania State Univ., University Park, PA. Dept. of Computer Science and Engineering.

ACCURATE ESTIMATION OF OBJECT LOCATION IN AN IMAGE SEQUENCE USING HELICOPTER FLIGHT DATA **c06**

Yuan-Liang Tang and Rangachar Kasturi *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 147-157 (For primary document see N94-35043 10-63)

(Grant NAG1-1371)

Avail: CASI HC A03/MF A03

In autonomous navigation, it is essential to obtain a three-dimensional (3D) description of the static environment in which the vehicle is traveling. For a rotorcraft conducting low-latitude flight, this description is particularly useful for obstacle detection and avoidance. In this paper, we address the problem of 3D position estimation for static objects from a monocular sequence of images captured from a low-latitude flying helicopter. Since the environment is static, it is well known that the optical flow in the image will produce a radiating pattern from the focus of expansion. We propose a motion analysis system which utilizes the epipolar constraint to accurately estimate 3D positions of scene objects in a real world image sequence taken from a low-altitude flying helicopter. Results show that this approach gives good estimates of object positions near the rotorcraft's intended flight-path. Author (revised)

N94-35056*# Massachusetts Univ., Amherst, MA. Computer Science Dept.

AUTOMATED ANALYSIS OF COMPLEX DATA **c82**

Robert SaintAmant and Paul R. Cohen *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 161-171 (For primary document see N94-35043 10-63)

(Contracts F30602-91-C-0076; F30602-93-C-0100)

Avail: CASI HC A03/MF A03

We have examined some of the issues involved in automating exploratory data analysis, in particular the tradeoff between control and opportunism. We have proposed an opportunistic planning solution for this tradeoff, and we have implemented a prototype, Igor, to test the approach. Our experience in developing Igor was surprisingly smooth. In contrast to earlier versions that relied on rule representation, it was straightforward to increment Igor's knowledge base without causing the search space to explode. The planning representation appears to be both general and powerful, with high level strategic knowledge provided by goals and plans, and the hooks for domain-specific knowledge are provided by monitors and focusing heuristics. Author (revised)

N94-35057*# Caelum Research Corp., Silver Spring, MD.

AN ADAPTIVE TECHNIQUE TO MAXIMIZE LOSSLESS IMAGE DATA COMPRESSION OF SATELLITE IMAGES **c82**

Robert J. Stewart, Y. M. Fleming Lure, and C. S. Joe Liou *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 173-182 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

Data compression will pay an increasingly important role in the storage and transmission of image data within NASA science programs as the Earth Observing System comes into operation. It is important that the science data be preserved at the fidelity the instrument and the satellite communication systems were designed to produce. Lossless compression must therefore be applied, at least, to archive the processed instrument data. In this paper, we present an analysis of the performance of lossless compression techniques and develop an adaptive approach which applied image remapping, feature-based image segmentation to determine regions of similar entropy and high-order arithmetic coding to obtain significant improvements over the use of conventional compression techniques alone. Image remapping is used to transform the original image into a lower entropy state. Several techniques were tested on satellite images including differential pulse code modulation, bi-linear interpolation, and block-based linear predictive coding. The results of these experiments are discussed and trade-offs between computation requirements and entropy reductions are used to identify the optimum approach for a variety of satellite images. Further entropy reduction can be achieved by segmenting the image based on local entropy properties then applying a coding technique which maximizes compression for the region. Experimental results are presented showing the effect of different coding techniques for regions of different entropy. A rule-base is developed through which the technique giving the best compression is selected. The paper concludes that maximum compression can be achieved cost effectively and at acceptable performance rates with a combination of techniques which are selected based on image contextual information. Author (revised)

N94-35058*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

AUTOMATIC CATALOGUING AND CHARACTERIZATION OF EARTH SCIENCE DATA USING SE-TREES

Ron Rymon (Pennsylvania Univ., Philadelphia.) and Nicholas M. Short, Jr. *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 183-192 (For primary document see N94-35043 10-63)

(Contract DAAL03-89-C-0031)

Avail: CASI HC A02/MF A03

In the future, NASA's Earth Observing System (EOS) platforms will produce enormous amounts of remote sensing image data that will be stored in the EOS Data Information System. For the past several years, the Intelligent Data Management group at Goddard's Information Science and Technology Office has been researching techniques for automatically cataloguing and characterizing image data (ADCC) from EOS into a distributed database. At the core of the approach, scientists will be able to retrieve data based upon the contests of the imagery. The ability to automatically classify imagery is key to the success of contents-based search. We report results from experiments applying a novel machine learning framework, based on Set-Enumeration (SE) trees, to the ADCC domain. We experiment with two images: one taken from the Blackhills region in South Dakota; and the other from the Washington DC area. In a classical machine learning experimentation approach, an image's pixels are randomly partitioned into training (i.e. including ground truth or survey data) and testing sets. The prediction model is built using the pixels in the training set, and its performance is estimated using the testing set. With the first Blackhills image, we perform various experiments achieving an accuracy level of 83.2 percent, compared to 72.7 percent using a Back Propagation Neural Network (BPNN) and 65.3 percent using a Gaussain Maximum Likelihood Classifier (GMLC). However, with the Washington DC image, we were only able to achieve 71.4 percent, compared with 67.7 percent reported for the BPNN model and 62.3 percent for the GMLC. Author (revised)

N94-35059*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

VEG: AN INTELLIGENT WORKBENCH FOR ANALYSING SPECTRAL REFLECTANCE DATA

P. Ann Harrison (JJM Systems, Inc., Arlington, VA.), Patrick R. Harrison (Naval Academy, Annapolis, MD.), and Daniel S. Kimes *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 193-205 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

An Intelligent Workbench (VEG) was developed for the systematic study of remotely sensed optical data from vegetation. A goal of the remote sensing community is to infer the physical and biological properties of vegetation cover (e.g. cover type, hemispherical reflectance, ground cover, leaf area index, biomass, and photosynthetic capacity) using directional spectral data. VEG collects together, in a common format, techniques previously available from many different sources in a variety of formats. The decision as to when a particular technique should be applied is nonalgorithmic and requires expert knowledge. VEG has codified this expert knowledge into a rule-based decision component for determining which technique to use. VEG provides a comprehensive interface that makes applying the techniques simple and aids a researcher in developing and testing new techniques. VEG also provides a classification algorithm that can learn new classes of surface features. The learning system uses the database of historical cover types to learn class descriptions of one or more classes of cover types. Author (revised)

N94-35060*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

A STATISTICAL INFERENCE APPROACH FOR THE RETRIEVAL OF THE ATMOSPHERIC OZONE PROFILE FROM SIMULATED SATELLITE MEASUREMENTS OF SOLAR BACKSCATTERED ULTRAVIOLET RADIATION **c45**

N. L. Bonavito, C. L. Gordon, R. Inguva, G. N. Serafino, and R. A. Barnes *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence 207-222 (SEE N94-35043 10-63) May 1994 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

NASA's Mission to Planet Earth (MTPE) will address important interdisciplinary and environmental issues such as global warming, ozone depletion, deforestation, acid rain, and the like with its long term satellite observations of the Earth and with its comprehensive Data and Information System. Extensive sets of satellite observations supporting MTPE will be provided by the Earth Observing System (EOS), while more specific process related observations will be provided by smaller Earth Probes. MTPE will use data from ground and airborne scientific investigations to supplement and validate the global observations obtained from satellite imagery, while the EOS satellites will support interdisciplinary research and model development. This is important for understanding the processes that control the global environment and for improving the prediction of events. In this paper we illustrate the potential for powerful artificial intelligence (AI) techniques when used in the analysis of the formidable problems that exist in the NASA Earth Science programs and of those to be encountered in the future MTPE and EOS programs. These techniques, based on the logical and probabilistic reasoning aspects of plausible inference, strongly emphasize the synergetic relation between data and information. As such, they are ideally suited for the analysis of the massive data streams to be provided by both MTPE and EOS. To demonstrate this, we address both the satellite imagery and model enhancement issues for the problem of ozone profile retrieval through a method based on plausible scientific inferencing. Since in the retrieval problem, the atmospheric ozone profile that is consistent with a given set of measured radiances may not be unique, an optimum statistical method is used to estimate a 'best' profile solution from the radiances and from additional a priori information.

Author

N94-35061*# Indian Space Research Organization, Ahmedabad.

APPLICATION OF ARTIFICIAL NEURAL NETWORKS IN HYDROLOGICAL MODELING: A CASE STUDY OF RUNOFF SIMULATION OF A HIMALAYAN GLACIER BASIN

A. M. Buch, A. Narain, and P. C. Pandey *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 223-230 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

The simulation of runoff from a Himalayan Glacier basin using an Artificial Neural Network (ANN) is presented. The performance of the ANN model is found to be superior to the Energy Balance Model and the Multiple Regression model. The RMS Error is used as the figure of merit for judging the performance of the three models, and the RMS Error for the ANN model is the latest of the three models. The ANN is faster in learning and exhibits excellent system generalization characteristics.

Author

N94-35062*# Illinois Univ., Urbana-Champaign, IL. Dept. of Mechanical and Industrial Engineering.

INTELLIGENT RESOURCES FOR SATELLITE GROUND CONTROL OPERATIONS

Patricia M. Jones *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 233-239 (For primary document see N94-35043 10-63)

(Grants NAG5-244; NSF IRI-92-10918)

Avail: CASI HC A02/MF A03

This paper describes a cooperative approach to the design of intelligent automation and describes the Mission Operations Cooperative Assistant for NASA Goddard flight operations. The cooperative problem solving approach is being explored currently in the context of providing support for human operator teams and also in the definition of future advanced automation in ground control systems.

Author

N94-35063*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

VISTA GOES ONLINE: DECISION-ANALYTIC SYSTEMS FOR REAL-TIME DECISION-MAKING IN MISSION CONTROL

Matthew Barry, Eric Horvitz, Corinne Ruokangas, and Sampath Srinivas *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 241-252 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

The Vista project has centered on the use of decision-theoretic approaches for managing the display of critical information relevant to real-time operations decisions. The Vista-I project originally developed a prototype of these approaches for managing flight control displays in the Space Shuttle Mission Control Center (MCC). The follow-on Vista-II project integrated these approaches in a workstation program which currently is being certified for use in the MCC. To our knowledge, this will be the first application of automated decision-theoretic reasoning techniques for real-time spacecraft operations. We shall describe the development and capabilities of the Vista-II system, and provide an overview of the use of decision-theoretic reasoning techniques to the problems of managing the complexity of flight controller displays. We discuss the relevance of the Vista techniques within the MCC decision-making environment, focusing on the problems of detecting and diagnosing spacecraft electromechanical subsystems component failures with limited information, and the problem of determining what control actions should be taken in high-stakes, time-critical situations in response to a diagnosis performed under uncertainty. Finally, we shall outline our current research directions for follow-on projects.

Author

N94-35064*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

MISSION EVALUATION ROOM INTELLIGENT DIAGNOSTIC AND ANALYSIS SYSTEM (MIDAS)

Ginger L. Pack, Jane Falgout, Joseph Barcio, Steve Shnurer, David Wadsworth, and Louis Flores *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 253-267 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

The role of Mission Evaluation Room (MER) engineers is to provide engineering support during Space Shuttle missions, for Space Shuttle systems. These engineers are concerned with ensuring that the systems for which they are responsible function reliably, and as intended. The MER is a central facility from which engineers may work, in fulfilling this obligation. Engineers participate in real-time monitoring of shuttle telemetry data and provide a variety of analyses associated with the operation of the shuttle. The Johnson Space Center's Automation and Robotics Division is working to transfer advances in intelligent systems technology to NASA's operational environment. Specifically, the MER Intelligent Diagnostic and Analysis System (MIDAS) project provides MER engineers with software to assist them with monitoring, filtering and analyzing Shuttle telemetry data, during and after Shuttle missions. MIDAS off-loads to computers and software, the tasks of data gathering, filtering, and analysis, and provides the engineers with information which is in a more concise and usable form needed to support decision making and engineering evaluation. Engineers are then able to concentrate on more difficult problems as they arise. This paper describes some, but not all of the applications that have been developed for MER engineers, under the MIDAS Project. The sampling described herewith was selected to show the range of tasks that engineers must perform for mission support, and to show the various levels of automation that have been applied to assist their efforts.

Author

N94-35065*# State Univ. of New York, Binghamton, NY.

QUALITATIVE MODEL-BASED DIAGNOSIS USING POSSIBILITY THEORY

Cliff Joslyn *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 269-283 (For primary document see N94-35043 10-63)

(Grant NGT-50756)

Avail: CASI HC A03/MF A03

The potential for the use of possibility in the qualitative model-based diagnosis of spacecraft systems is described. The first sections of the paper briefly introduce the Model-Based Diagnostic (MBD) approach to spacecraft fault diagnosis; Qualitative Modeling (QM) methodologies; and the concepts of possibilistic modeling in the context of Generalized Information Theory (GIT). Then the necessary conditions for the applicability of possibilistic methods to qualitative MBD, and a number of potential directions for such an application, are described.

Author

N94-35066*# Temple Univ., Philadelphia, PA. Dept. of Electrical Engineering.

AN INTELLIGENT CONTROL SYSTEM FOR FAILURE DETECTION AND CONTROLLER RECONFIGURATION

Saroj K. Biswas *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 285-291 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

We present an architecture of an intelligent restructurable control system to automatically detect failure of system components, assess its impact on system performance and safety, and reconfigure the controller for performance recovery. Fault detection is based on neural network associative memories and pattern classifiers, and is implemented using a multilayer feedforward network. Details of the fault detection network along with simulation results on health monitoring of a dc motor have been presented. Conceptual developments for fault assessment using an expert system and controller reconfiguration using a neural network are outlined. Author

N94-35067*# University of Southern California, Marina del Rey, CA. Information Sciences Inst.

TELECOMMUNICATIONS ISSUES OF INTELLIGENT DATABASE MANAGEMENT FOR GROUND PROCESSING SYSTEMS IN THE EOS ERA **c82**

Joseph D. Touch *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 295-303 (For primary document see N94-35043 10-63)

(Contract DABT63-91-C-0001)

Avail: CASI HC A02/MF A03

Future NASA earth science missions, including the Earth Observing System (EOS), will be generating vast amounts of data that must be processed and stored at various locations around the world. Here we present a stepwise-refinement of the intelligent database management (IDM) of the distributed active archive center (DAAC - one of seven regionally-located EOSDIS archive sites) architecture, to showcase the telecommunications issues involved. We develop this architecture into a general overall design. We show that the current evolution of protocols is sufficient to support IDM at Gbps rates over large distances. We also show that network design can accommodate a flexible data ingestion storage pipeline and a user extraction and visualization engine, without interference between the two. Author

N94-35068*# Symbiotics, Inc., Cambridge, MA.

GROUP-ORIENTED COORDINATION MODELS FOR DISTRIBUTED CLIENT-SERVER COMPUTING

Richard M. Adler and Craig S. Hughes *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 305-318 (For primary document see N94-35043 10-63)

(Contracts NAS8-39343; NAS8-39905)

Avail: CASI HC A03/MF A03

This paper describes group-oriented control models for distributed client-server interactions. These models transparently coordinate requests for services that involve multiple servers, such as queries across distributed databases. Specific capabilities include: decomposing and replicating client requests; dispatching request subtasks or copies to independent, networked servers; and combining server results into a single response for the client. The control models were implemented by combining request broker and process group technologies with an object-oriented communication middleware tool. The models are illustrated in the context of a distributed operations support application for space-based systems. Author

N94-35069*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A DISTRIBUTED COMPUTING MODEL FOR TELEMETRY DATA PROCESSING **c17**

Matthew R. Barry (Rockwell Space Operations Co., Houston, TX.), Kevin L. Scott, and Steven P. Weismuller *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 319-328 (For primary document see N94-35043 10-63)

Avail: CASI HC A02/MF A03

We present a new approach to distributing processed telemetry data among spacecraft flight controllers within the control centers at NASA's Johnson Space Center. This approach facilitates the development of application programs which integrate spacecraft-telemetered data and ground-based synthesized data, then distributes this information to flight controllers for analysis and decision-making. The new approach combines various distributed computing models into one hybrid distributed computing model. The model employs both client-server and peer-to-peer distributed computing models cooperating to provide users with information throughout a diverse operations environment. Specifically, it provides an attractive foundation upon which we are building critical real-time monitoring and control applications, while simultaneously lending itself to peripheral applications in playback operations, mission preparations, flight controller training, and program development and verification. We have realized the hybrid distributed computing model through an information sharing protocol. We shall describe the motivations that inspired us to create this protocol, along with a brief conceptual description of the distributed computing models it employs. We describe the protocol design in more detail, discussing many of the program design considerations and techniques we have adopted. Finally, we describe how this model is especially suitable for supporting the implementation of distributed expert system applications. Author

N94-35070*# Aerospace Corp., El Segundo, CA. Computer Systems Div.

ISTAR: INTELLIGENT SYSTEM FOR TELEMETRY ANALYSIS IN REAL-TIME **c17**

Charles Simmons *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 329-342 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

The intelligent system for telemetry analysis in real-time (ISTAR) is an advanced vehicle monitoring environment incorporating expert systems, analysis tools, and on-line hypermedia documentation. The system was developed for the Air Force Space and Missile Systems Center (SMC) in Los Angeles, California, in support of the inertial upper stage (IUS) booster vehicle. Over a five year period the system progressed from rapid prototype to operational system. ISTAR has been used to support five IUS missions and countless mission simulations. There were a significant number of lessons learned with respect to integrating an expert system capability into an existing ground system. Author (revised)

N94-35071*# Durham Univ. (England). Artificial intelligence Systems Research Group.

ENGINEERING LARGE-SCALE AGENT-BASED SYSTEMS WITH CONSENSUS

A. Bokma, A. Slade, S. Kerridge, and K. Johnson *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 343-356 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

The paper presents the consensus method for the development of large-scale agent-based systems. Systems can be developed as networks of knowledge based agents (KBA) which engage in a collaborative problem solving effort. The method provides a comprehensive and integrated approach to the development of this type of system. This includes a systematic analysis of user requirements as well as a structured approach to generating a system design which exhibits the desired functionality. There is a direct correspondence between system requirements and design components. The benefits of this approach are that requirements are traceable into design components and code thus facilitating verification. The use of the consensus method with two major test applications showed it to be successful and also provided valuable insight into problems typically associated with the development of large systems. Author (revised)

N94-35072*# BSO/Aerospace and Systems B.V., Nieuwegein (Netherlands).

SPACE/GROUND SYSTEMS AS COOPERATING AGENTS

T. J. Grant *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 357-368 (For primary document see N94-35043 10-63)

Avail: CASI HC A03/MF A03

Within NASA and the European Space Agency (ESA) it is agreed that autonomy is an important goal for the design of future spacecraft and that

this requires on-board artificial intelligence. NASA emphasizes deep space and planetary rover missions, while ESA considers on-board autonomy as an enabling technology for missions that must cope with imperfect communications. ESA's attention is on the space/ground system. A major issue is the optimal distribution of intelligent functions within the space/ground system. This paper describes the multi-agent architecture for space/ground systems (MAASGS) which would enable this issue to be investigated. A MAASGS agent may model a complete spacecraft, a spacecraft subsystem or payload, a ground segment, a spacecraft control system, a human operator, or an environment. The MAASGS architecture has evolved through a series of prototypes. The paper recommends that the MAASGS architecture should be implemented in the operational Dutch Utilization Center. Author (revised)

N94-33646*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
IMIS: AN INTELLIGENCE MICROSCOPE IMAGING SYSTEM Abstract Only
Michael Caputo (Krug Life Sciences, Inc., Houston, TX.), Norwood Hunter (Krug Life Sciences, Inc., Houston, TX.), and Gerald Taylor *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 554 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

N94-34031*# TeleRobotics International, Inc., Knoxville, TN.
CONTROLLING TELEROBOTS WITH VIDEO DATA AND COMPENSATING FOR TIME-DELAYED VIDEO USING OMNIVIEW
Dan Kuban, Steve Zimmerman, and Lee Martin *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 86-93 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34037*# National Inst. of Standards and Technology, Gaithersburg, MD. Robot Systems Div.
GROUND VEHICLE CONTROL AT NIST: FROM TELEOPERATION TO AUTONOMY
Karl N. Murphy, Maris Juberts, Steven A. Legowik, Marilyn Nashman, Henry Schneiderman, Harry A. Scott, and Sandor Szabo *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 137-142 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34038*# Army Research Lab., Aberdeen Proving Ground, MD.
INTELLIGENT VEHICLE CONTROL: OPPORTUNITIES FOR TERRESTRIAL-SPACE SYSTEM INTEGRATION Abstract Only
Charles Shoemaker *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 143 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34043*# California Univ., Los Angeles, CA. Cognitive Systems Lab.
FROM CONDITIONAL OUGHTS TO QUALITATIVE DECISION THEORY
Judea Pearl *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 178-186 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-34048*# California Univ., Berkeley, CA.
FUZZY LOGIC, NEURAL NETWORKS, AND SOFT COMPUTING Abstract Only
Lofti A. Zadeh *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 217 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34052*# Texas Univ., Austin, TX. Computer Science Dept.
SELF-CALIBRATING MODELS FOR DYNAMIC MONITORING AND DIAGNOSIS
Benjamin Kuipers *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 245-252 (For primary document see N94-34019 10-99)
(Contract NAG9-665; NCC2-760; NSF IRI-89-04454; NSF IRI-90-17047)
Avail: CASI HC A02/MF A04

N94-34053*# Pittsburgh Univ., PA. Dept. of Computer Science.
FILTERING AS A REASONING-CONTROL STRATEGY: AN EXPERIMENTAL ASSESSMENT
Martha E. Pollack *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 253-260 (For primary document see N94-34019 10-99)
(Contracts F49620-91-C-0005; F49620-92-J-0422; F30602-93-C-0038; NSF IRI-92-58392)
Avail: CASI HC A02/MF A04

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N94-33384# Carnegie-Mellon Univ., Pittsburgh, PA. Graduate School of Industrial Administration.
BALANCED 0, + OR - MATRICES. PART 1: DECOMPOSITION
Michele Conforti, Gerard Cornuejols, Ajai Kapuur, and Kristina Vuskovic 22 Jan. 1994 53 p
(Contract N00014-89-J-1063; NSF DDM-90-01705; NSF DDM-92-01340)
(AD-A278170) Avail: CASI HC A04/MF A01

A 0,+ or -1 matrix is balanced if, in every square submatrix with two nonzero entries per row and column, the sum of the entries is a multiple of four. This paper extends the decomposition of balanced 0,1 matrices obtained by Conforti, Cornuejols and Rao to the class of balanced 0, + or -1 matrices. As a consequence, we obtain a polynomial time algorithm for recognizing balanced 0,+ or -1 matrices. DTIC

N94-33392 Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
AN INTRODUCTION TO THE CONJUGATE GRADIENT METHOD THAT EVEN AN IDIOT CAN UNDERSTAND
Jonathan R. Shewchuk 7 Mar. 1994 61 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant NSF ASC-93-18163)
(AD-A277565; CMU-CS-94-125) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The conjugate gradient method is the most prominent iterative method for solving sparse systems of linear equations. Unfortunately, many textbook treatments of the topic are written so that even their own authors would be mystified, if they bothered to read their own writing. For this reason, an understanding of the method has been reserved for the elite brilliant few who have painstakingly decoded the mumblings of their forebears. Nevertheless, the conjugate gradient method is a composite of simple, elegant ideas that even stupid people can understand. Of course, a reader as intelligent as yourself will learn them almost effortlessly. The idea of quadratic forms is introduced and used to derive the methods of steepest descent, conjugate directions, and conjugate gradients. Eigenvectors are explained and used to examine the convergence of the Jacobi method, steepest descent, and conjugate gradients. Other topics include preconditioning and the nonlinear conjugate gradient method. I have taken pains to make this article easy to read. Sixty-two illustrations are provided. Dense prose is avoided. Concepts are explained in several different ways. Most equations are coupled with an intuitive interpretation. DTIC

N94-33406 Nantes Univ. (France).
THE 2ND INTERNATIONAL CONFERENCE ON CURVES AND SURFACES: ABSTRACTS Abstracts Only
16 Jun. 1993 35 p Conference held in Chamonix Mont-Blanc, France,

10-16 Jun. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAJA45-93-M-0369)
(AD-A276805; R/D-7166-CH-02) Avail: CASI HC A03

Abstracts from the Second International Conference on Curves and Surfaces are presented. The conference was held at Chamonix Mont-Blanc, France, on 10-16 Jun. 1993. DTIC

N94-33417 Wisconsin Univ., Milwaukee, WI.
ON THE BOUNDARY INTEGRAL EQUATION METHODS FOR AN EXTENDED TIME-HARMONIC MAXWELL TYPE SYSTEM Ph.D. Thesis
George Antony Avirappattu 1992 99 p
Avail: Univ. Microfilms Order No. DA9319361

Electromagnetic wave propagation is governed by Maxwell's equations and sound wave propagation can be modeled by acoustics equations. We study a set up in which one can discuss various types of boundary value problems using integral equations, for a combined system of linear, time-harmonic Maxwell's and acoustics equations, following an idea of Picard. The structure as well as maintenance of the first order of the system are noticeable features. Dissert. Abstr.

N94-33430 Ohio State Univ., Columbus. Dept. of Mathematics.
WHISKERED TORI FOR INTEGRABLE PDE'S: CHAOTIC BEHAVIOR IN NEAR INTEGRABLE PDE'S Final Report
Edward A. Overman, II and David W. McLaughlin 1 Nov. 1994 3 p
Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0230-91)
(AD-A278390; AFOSR-94-0240TR) Avail: CASI HC A01

This is the final report for a project studying the perturbed sine-Gordon partial differential equations and the nonlinear Schroedinger partial differential equations. We studied low-dimensional chaos in these dissipative partial differential equations in order to understand the onset of chaos, the underlying geometry of the partial differential equations, and how the chaos is low-dimensional. DTIC

N94-33717# Lawrence Livermore National Lab., CA.
A NEW POINT-CENTERED DIFFUSION DIFFERENCING FOR UNSTRUCTURED MESHES
T. S. Palmer 18 Jan. 1994 6 p Presented at the 11th Topical Meeting on the Technology of Fusion Energy, New Orleans, LA, 19-24 Jun. 1994
(Contract W-7405-eng-48)
(DE94-006399; UCRL-JC-116063; CONF-940630-3) Avail: CASI HC A02/MF A01

During the last few years, there has been an increased effort to devise robust transport differencings for unstructured meshes, specifically arbitrarily connected grids of polygons. Conversely, development of diffusion methods on these grids has been lacking. While Morel, Kershaw, Shestakov and others have done a great deal of work on diffusion schemes for logically-rectangular grids, to our knowledge there has been little or no work on discretizations of the diffusion equation on unstructured meshes of polygons. In this paper, we introduce a point-centered diffusion differencing for general two-dimensional unstructured meshes. The method has the following attractive properties: (1) transition to the standard five-point point-centered scheme on orthogonal meshes; (2) preservation of the homogeneous linear solution; (3) second-order accuracy; (4) strict conservation within the control volume surrounding each point; and (5) convergence to the exact result as the mesh is refined, regardless of the smoothness of the mesh. The only potential disadvantage of the method is that the diffusion matrix is asymmetric, in general. DOE

N94-33834# Pittsburgh Univ., PA. Inst. for Computational Mathematics and Applications.
TIME-DEPENDENT, LINEAR DAE'S WITH DISCONTINUOUS INPUTS Technical Report
Patrick J. Rabier and Werner C. Rheinboldt 24 Mar. 1994 20 p
(Contract N00014-90-J-1025; NSF CCR-92-03488)
(AD-A277839; ICMA-TR-94-186) Avail: CASI HC A03/MF A01

Existence and uniqueness results are proved for initial value problems associated with linear, time-varying, differential-algebraic equations. The right-hand sides are chosen in a space of distributions allowing for solutions exhibiting discontinuities as well as impulses. This approach also provides a satisfactory answer to the problem of inconsistent initial conditions of crucial importance for the physical applications. Furthermore, our theoretical results yield an efficient numerical procedure for the calculation of the jump and impulse of a solution at a point of discontinuity. Numerical examples are given. DTIC

N94-33985# Oak Ridge National Lab., TN.
DYNAMIC SUBTREES: A NEW DATA STRUCTURE FOR MANIPULATING TREES
Y. Xu 1994 9 p Presented at the Symposium on Theory of Computing, Montreal, Canada, 23-25 May 1994
(Contract DE-AC05-84OR-21400)
(DE94-009168; CONF-940563-2) Avail: CASI HC A02/MF A01

This paper presents a new data structure, called dynamic subtrees, which manipulates an undirected forest. The data structure supports three main operations: cut, link, and comp. A cut operation splits a tree into two by cutting an edge of the tree; a link operation joins two trees by linking two arbitrarily specified vertices of the trees; a comp operation computes a function f(S) = f(v(sub 1)) circle dot f(v(sub 2)) circle dot ..., for all vertices v(sub i) of S, where S is either tree of T - e, with T being the tree under consideration and e an arbitrarily given edge of T, f(v) element of F, a finite set, and circle dot is a closed commutative and associative binary operation over F. Assuming, s(sub t) is the time for implementing a circle dot operation, each of the cut, link, and comp operations can be implemented in 0 ((s(sub t) + log n) log n) time, after a preprocessing in 0(s(sub t)n) time, where n is the number of vertices of the forest under consideration. DOE

N94-34004# Army Research Lab., Aberdeen Proving Ground, MD.
NEW PROOF AND EXTENSION OF SARKOVSKII'S THEOREM Final Report, May 1991 - May 1993
N. P. Bhatia and W. O. Egerland Feb. 1994 21 p
(AD-A278347; ARL-TR-355) Avail: CASI HC A03/MF A01

Elementary periodic orbits are introduced and are shown to obey a total order. The total ordering of the elementary periodic orbits provides the basis for the proof of Theorem (SE), the principal result of this report. Theorem (SE) is an extension of Sarkovskii's Theorem and subsumes it. Theorem (SE) incorporates the notion of E(infinity) as an infinite preorbit which is directly related to the notion of turbulence. A paper with the same title was submitted for publication in the Journal of Mathematical Analysis and Applications. DTIC

N94-34105# National Defence Research Establishment, Stockholm (Sweden). Dept. of Weapon Systems, Effects and Protection.
APPLICATION OF THE COMPOUND-MATRIX METHOD TO WAVE PROPAGATION IN RANGE-INDEPENDENT FLUID-SOLID MEDIA
S. Ivansson Dec. 1993 32 p
(PB94-149077; FOA-C-20951-2.2) Avail: CASI HC A03/MF A01

This is the second of two companion papers. The first paper deals with the compound-matrix method for linear multi-point boundary-value ordinary differential equation (ODE) problems. In the present paper, the authors show how the general method can be applied to the particular case of P-SV wave propagation computations for range-independent fluid-solid media. The theory is formulated for a multi-region fluid-solid medium with an arbitrary number of alternating fluid and solid regions, using proper multi-point boundary conditions. A solution to the adjoint problem can be obtained directly from a solution to the original problem. The well-known formula for modal excitation coefficients is generalized so that leaky modes (which are characterized by an exponential increase in the outward direction) are included as well. Modal depth functions can be computed reliably without experimenting with a cut-off depth for an artificial homogeneous half-space. In the common case of a medium composed of homogeneous layers, the authors show how efficient computations can be achieved by writing the propagator matrices involved as products of sparse matrices, which are then applied in sequence. The numbers of different arithmetic operations needed are specified in a table. NTIS

N94-34112 Oxford Univ. (England). Programming Research Group.
ALGEBRAIC APPROACH TO COMPILER DESIGN Ph.D. Thesis
A. Sampalo 1993 168 p

(PB94-149630; PRG-110) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The general purpose of the thesis is to investigate the design of compilers for procedural languages, based on the algebraic laws which these languages satisfy. The particular strategy adopted is to reduce an arbitrary source program to a normal form which describes precisely the behavior of the target machine. This is achieved by a series of algebraic transformations which are proved from the more basic laws. The correctness of the compiler follows from the correctness of each algebraic transformation. The entire process is formalized within this single and uniform semantic framework of a procedural language and its algebraic laws. But in order to attain abstraction and more reasoning power, the language comprises specification features in addition to the programming constructs to be implemented. These features are used to define a very general normal form, capable of representing an arbitrary target machine. The normal form reduction theorems can therefore be reused in the design of compilers which produce code for distinct target machines. NTIS

N94-34158 Maryland Univ., College Park, MD. Inst. for Physical Science and Technology.

STUDY OF SUPERCONVERGENCE BY A COMPUTER-BASED APPROACH: SUPERCONVERGENCE OF THE GRADIENT IN FINITE ELEMENT SOLUTIONS OF LAPLACE'S AND POISSON'S EQUATIONS Final Report

I. Babuska, T. Strouboulis, C. S. Upadhyay, and S. K. Gangaraj Nov. 1993 97 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-90-J-1030)

(AD-A277537; BN-1155) Avail: CASI HC A05

This paper addresses the problem of existence of the superconvergence points by a computer based proof. We prove a basic mathematical theorem that the superconvergence point exists if and only if it can be found by certain numerical algorithm. We address the problem of the superconvergence points for the gradient of the finite element solution of the Laplace and Poisson equations. Our study shows that the sets of superconvergence points are very different for these two cases. We consider triangular as well as quadrilateral elements of degree p, 1 less than or = p less than or = 7. In the case of quadrilateral elements, we analyze, among others, the tensor-product and the serendipity elements. DTIC

N94-34260*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

PSEUDOSPECTRAL COLLOCATION METHODS FOR FOURTH ORDER DIFFERENTIAL EQUATIONS Final Report

Alaeddin Malek and Timothy N. Phillips May 1994 36 p Submitted for publication

(Contract NAS1-19480; RTOP 505-90-52-01)

(NASA-CR-194917; NAS 1.26:194917; ICASE-94-35) Avail: CASI HC A03/MF A01

Collocation schemes are presented for solving linear fourth order differential equations in one and two dimensions. The variational formulation of the model fourth order problem is discretized by approximating the integrals by a Gaussian quadrature rule generalized to include the values of the derivative of the integrand at the boundary points. Collocation schemes are derived which are equivalent to this discrete variational problem. An efficient preconditioner based on a low-order finite difference approximation to the same differential operator is presented. The corresponding multidomain problem is also considered and interface conditions are derived. Pseudospectral approximations which are C1 continuous at the interfaces are used in each subdomain to approximate the solution. The approximations are also shown to be C3 continuous at the interfaces asymptotically. A complete analysis of the collocation scheme for the multidomain problem is provided. The extension of the method to the biharmonic equation in two dimensions is discussed and results are presented for a problem defined in a nonrectangular domain. Author

N94-34261*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

ON THE GIBBS PHENOMENON 4: RECOVERING EXPONENTIAL ACCURACY IN A SUB-INTERVAL FROM A GEGENBAUER PARTIAL SUM OF A PIECEWISE ANALYTIC FUNCTION Final Report

David Gottlieb (Brown Univ., Providence, RI.) and Chi-Wang Shu (Brown Univ., Providence, RI.) May 1994 19 p Submitted for publication

(Contracts NAS1-19480; NAG1-1145; DAAL03-91-G-0123; N00014-91-J-4016; AF-AFOSR-0090-93; NSF DMS-92-11820; RTOP 505-90-52-01)

(NASA-CR-194912; NAS 1.26:194912; ICASE-94-33) Avail: CASI HC A03/MF A01

We continue our investigation of overcoming Gibbs phenomenon, i.e., to obtain exponential accuracy at all points (including at the discontinuities themselves), from the knowledge of a spectral partial sum of a discontinuous but piecewise analytic function. We show that if we are given the first N Gegenbauer expansion coefficients, based on the Gegenbauer polynomials C(sub k)(sup mu)(x) with the weight function (1 - x(exp 2))(exp mu - 1/2) for any constant mu is greater than or equal to 0, of an L(sub 1) function f(x), we can construct an exponentially convergent approximation to the point values of f(x) in any subinterval in which the function is analytic. The proof covers the cases of Chebyshev or Legendre partial sums, which are most common in applications. Author (revised)

N94-34301# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

SEVERAL MODIFIED GOODNESS-OF-FIT TESTS FOR THE CAUCHY DISTRIBUTION WITH UNKNOWN SCALE AND LOCATION PARAMETERS M.S. Thesis

Bora H. Oenen Mar. 1994 307 p

(AD-A278496; AFIT/GOR/ENS/94M-09) Avail: CASI HC A14/MF A03

Kolmogorov-Simirnov and the Kuiper goodness-of-fit tests are studied for the Cauchy distribution with the unknown location and scale parameters. Monte Carlo simulation studies were performed using maximum likelihood estimation to calculate the critical values for standard Kolmogorov-Simirnov and the Kuiper tests. Then a reflection technique is introduced and the critical value tables are calculated for both the Reflected Kolmogorov-Simirnov and the Reflected Kuiper tests. Several sequential tests are performed by combining standard Kolmogorov-Simirnov and Kuiper in one test, standard Cramer-von Mises and the standard Kuiper in the other, and finally the reflected Cramer-von Mises and the standard Kuiper in the last one. The Monte Carlo simulations used 50000 repetitions for sample sizes of 5 through 50 with increment of 5. Throughout the study the location parameter is taken as 0 while the scale parameter is kept at 10. Power studies corresponding to each case are done and the results are presented in tables. The power studies are performed for sample sizes 5 through 50 and for a = 0.01, 0.05, 0.10, 0.15, and 0.20 for the standard and the reflected tests. For sequential tests, power studies have been accomplished for all of the significance level produced by combining two individual tests at form alpha = 0.01 to 0.20 with the increment of 0.01. The Kuiper test turns out to have an overwhelming power against all distributions in standard case. DTIC

N94-34922*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

A NOTE ON WINDOWING FOR THE WAVEFORM RELAXATION Final Report

Hong Zhang Apr. 1994 13 p Submitted for publication

(Contract NAS1-19480; NSF CCR-91-03296; RTOP 505-90-52-01)

(NASA-CR-194907; NAS 1.26:194907; ICASE-94-28) Avail: CASI HC A03/MF A01

The technique of windowing has been often used in the implementation of the waveform relaxations for solving ODE's or time dependent PDE's. Its efficiency depends upon problem stiffness and operator splitting. Using model problems, the estimates for window length and convergence rate are derived. The electiveness of windowing is then investigated for non-stiff and stiff cases respectively. It concludes that for the former, windowing is highly recommended when a large discrepancy exists between the convergence rate on a time interval and the ones on its subintervals. For the latter, windowing does not provide any computational advantage if machine features are disregarded. The discussion is supported by experimental results. Author

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N94-33678# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

THE USE OF L-MOMENTS TO FIT THE GENERALIZED LAMBDA DISTRIBUTION TO SAMPLE DATA M.S. Thesis

Robert B. Mohan Mar. 1994 205 p

(AD-A278549; AFIT/GST/ENS/94M-09) Avail: CASI HC A10/MF A03

The Generalized Lambda Distribution (GLD) is a four-parameter, continuous probability distribution that is useful for simulation analysis. The strengths of the GLD lie in its abilities to approximate many distributions, represent data when the underlying distribution is unknown, and fit or generate random variates. The method of moments is presently the accepted technique for estimating the parameters of this distribution. However, it is sensitive to extreme observations and subject to large sampling variability as the sample size decreases. L-moments are expectations of certain linear combinations of order statistics. They can be used to estimate parameters and quantiles of probability distributions. Their main advantage over conventional moments is that they suffer less from the effects of sampling variability, and are theoretically more robust to outliers than conventional moments. Estimating the parameters of the GLD by matching its L-moments to those of the sample is known as the method of L-moments. This appears to be an attractive alternative to the method of moments and is developed in this thesis. A Monte Carlo experiment compared the method of L-moments to the method of conventional moments and a third method which uses alternate measures of symmetry and tailweight. Experiment results showed that L-moments are better than conventional and alternate moments for fitting distributions to sample data, particularly when the skewness and kurtosis of the sample distribution are large.

DTIC

N94-33783# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

AN RSM STUDY OF THE EFFECTS OF SIMULATION WORK AND METAMODEL SPECIFICATION ON THE STATISTICAL QUALITY OF METAMODEL ESTIMATES M.S. Thesis

Michael K. Taylor Mar. 1994 73 p

(AD-A278551; AFIT/GOR/ENS/94M-15) Avail: CASI HC A04/MF A01

This research investigated the combined influence of simulation work and metamodel specification on the statistical quality of the estimates obtained from the resulting metamodels of the simulation data. A 9 x 2 x 2 experiment consisting of 9 cases of simulation work, 2 levels of metamodel specification, and 2 levels of design fractionation were designed for 8 different configurations of M/M/k queues. The only observed statistic for this experiment was the average queue length. Simulation estimates for each configuration's average queue length were calculated directly from the simulation data. In addition, the metamodels were fit to the simulation data and were used to estimate the average queue length for each configuration. Residuals were calculated for each estimate as the difference between the analytic solution for average queue length and the given estimate. The residuals were analyzed graphically and via Single-Factor ANOVA to determine if the amount of simulation work or metamodel specification affected the statistical quality of the estimates. This research showed conclusively that the amount of simulation work had no significant effect and that the metamodel specification had a significant effect on the statistical quality of the estimates obtained from metamodels. DTIC

N94-34257 Newcastle-upon-Tyne Univ. (England). Dept. of Computing Science.

SYSTOLIC MATRIX INVERSION USING A MONTE CARLO METHOD

G. M. Megson, V. N. Aleksandrov, and I. T. Dimov 1993 32 p

(PB94-148798; TRS-448) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

A systolic array for inverting an n x n matrix using a Monte-Carlo method is proposed. The basic array computes a single row of the inverse in 3n+N+T steps (including input and output time) and O (nNT) cells where N is the number of chains and T is the length of each chain in the stochastic process. A full inverse is computed in the same time but requires O (nu(Sup 2)NT) cells. Further improvements reduce the time to 3n/2+N+T using the same number of cells. A number of bounds on N and T are established which show that our design is faster than existing designs for reasonably large values of n. Indeed the final arrays require less than nu(Sup 4) cells and have a computing time bounded above by 4n. NTIS

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N94-34064*# Georgia Inst. of Tech., Atlanta, GA. School of Industrial and Systems Engineering.

INTELLIGENT COMMAND AND CONTROL SYSTEMS FOR SATELLITE GROUND OPERATIONS Semiannual Progress Report, Oct. 1993 - Mar. 1994

Christine M. Mitchell 30 Apr. 1994 14 p

(Grant NAG5-2227)

(NASA-CR-195852; NAS 1.26:195852) Avail: CASI HC A03/MF A01

The Georgia Tech portion of the Intelligent Control Center project includes several complementary activities. Two major activities entail thesis level research; the other activities are either support activities or preliminary explorations (e.g., task analyses) to support the research. The first research activity is the development of principles for the design of active interfaces to support monitoring during real-time supports. It is well known that as the operator's task becomes less active, i.e., more monitoring and less active control, there is concern that the operator will be less involved and less able to rapidly identify anomalous or failure situations. The research project to design active monitoring interfaces is an attempt to remediate this undesirable side-effect of increasingly automated control systems that still depend ultimately on operator supervision. The second research activity is the exploration of the use of case-based reasoning as a way to accumulate operator experience and make it available in computational form.

Derived from text

N94-34281*# Auburn Univ., AL. Dept. of Industrial Engineering.

ADVANCED TIMELINE SYSTEMS Final Report

R. L. Bulfin and C. A. Perdue 10 Apr. 1994 88 p

(Contract NAS8-39131)

(NASA-CR-193958; NAS 1.26:193958) Avail: CASI HC A05/MF A01

The Mission Planning Division of the Mission Operations Laboratory at NASA's Marshall Space Flight Center is responsible for scheduling experiment activities for space missions controlled at MSFC. In order to draw statistically relevant conclusions, all experiments must be scheduled at least once and may have repeated performances during the mission. An experiment consists of a series of steps which, when performed, provide results pertinent to the experiment's functional objective. Since these experiments require a set of resources such as crew and power, the task of creating a timeline of experiment activities for the mission is one of resource constrained scheduling. For each experiment, a computer model with detailed information of the steps involved in running the experiment, including crew requirements, processing times, and resource requirements is created. These models are then loaded into the Experiment Scheduling Program (ESP) which attempts to create a schedule which satisfies all resource constraints. ESP uses a depth-first search technique to place each experiment into a time interval, and a scoring function to evaluate the schedule. The mission planners generate several schedules and choose one with a high value of the scoring function to send through the approval process. The process of approving a mission timeline can take several months. Each timeline must meet the requirements of the scientists, the crew, and various engineering departments as well as enforce all resource restrictions. No single objective is considered in creating a timeline. The experiment scheduling problem is: given a set of experiments, place each experiment along the mission timeline so that all resource requirements and temporal constraints are met and the timeline is acceptable to all who must approve it. Much work has been done on multicriteria decision making (MCDM). When there are two criteria, schedules which perform well with respect to one criterion will often perform poorly with respect to the other. One schedule dominates another if it performs strictly better on one criterion, and no worse on the other. Clearly, dominated schedules are undesireable. A nondominated schedule can be generated by some sort of optimization

problem. Generally there are two approaches: the first is a hierarchical approach while the second requires optimizing a weighting or scoring function. Derived from text

N94-34720*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CARGO SYSTEMS MANUAL: HEAT PIPE PERFORMANCE (HPP) STS-66
Robert Napp Jun. 1994 33 p
(NASA-TM-109784; JSC-25665; NAS 1.15:109784) Avail: CASI HC A03/MF A01

The purpose of the cargo systems manual (CSM) is to provide a payload reference document for payload and shuttle flight operations personnel during shuttle mission planning, training, and flight operations. It includes orbiter-to-payload interface information and payload system information (including operationally pertinent payload safety data) that is directly applicable to the Mission Operations Directorate (MOD) role in the payload mission. The primary objectives of the heat pipe performance (HPP) are to obtain quantitative data on the thermal performance of heat pipes in a microgravity environment. This information will increase understanding of the behavior of heat pipes in space and be useful for application to design improvements in heat pipes and associated systems. The purpose of HPP-2 is to establish a complete one-g and zero-g data base for axial groove heat pipes. This data will be used to update and correlate data generated from a heat pipe design computer program called Grooved Analysis Program (GAP). The HPP-2 objectives are to: determine heat transport capacity and conductance for open/closed grooved heat pipes and different Freon volumes (nominal, under, and overcharged) using a uniform heat load; determine heat transport capacity and conductance for single/multiple evaporators using asymmetric heat loads; obtain precise static, spin, and rewicking data points for undercharged pipes; investigate heat flux limits (asymmetric heat loads); and determine effects of positive body force on thermal performance. Derived from text

N94-34631# Eidetics International, Inc., Torrance, CA.
OPTIMAL TACTICS FOR AGILE AIRCRAFT TECHNOLOGY: A DIFFERENTIAL GAME METHODOLOGY
Urban H. D. Lynch *In* AGARD, Technologies for Highly Manoeuvrable Aircraft Mar. 1994 8 p (For primary document see N94-34605 10-05)
Copyright Avail: CASI HC A02/MF A03

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N94-33883# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ON A CONNECTION BETWEEN THE YANG-MILLS EQUATIONS IN DIMENSION GREATER THAN FOUR AND THE CLASSICAL YANG-BAXTER EQUATIONS
T. A. Ivanova and A. D. Popov 1992 16 p
(DE94-611115; JINR-E-2-92-107) Avail: CASI HC A03/MF A01 (US Sales Only)

We consider the Yang-Mills equations for gauge fields of an arbitrary semisimple Lie group G in Euclidean spaces R(sup 11) with dimension n greater than 4. DOE

N94-34001# California Inst. of Tech., Pasadena, CA. Dept. of Applied Mathematics.
DIFFERENTIAL EQUATIONS AND CONTINUUM MECHANICS Final Technical Report, 1 Oct. 1990 - 30 Nov. 1993
Donald S. Cohen 30 Nov. 1993 3 p
(Grant AF-AFOSR-0045-91)
(AD-A278341; AFOSR-94-0216TR) Avail: CASI HC A01/MF A01

The researchers were visited by Prof. Christopher Durning from the Dept of Chemical Engineering at Columbia University. Prof Durning has an extensive background in experimenting with several kinds of anomalous polymers (including Case II materials). In almost daily seminars Prof. Durning and Cohen, together with several of Cohen's grad students, formulated both a theoretical and experimental attack on problems arising in the strength and use of new materials and in problems from certain considerations in environmental chemistry. For example, new strong light-weight materials for use in both commercial and military vehicles will have many non-planar shapes. Thus, these materials will sometimes be subject to compression (on the concave side of a bent sheet) and sometimes to tension (on the convex side.) Experiments yield greatly differing results in the two cases. The researchers need to incorporate the physics of these situations into their Case II diffusive model and accurately formulate the physics at the interfacial moving boundary. For the problems involving polymer films for use in protective clothing and uniforms and as separating membranes in environmental protective and clean-up devices, chemical effects often take place at the moving interface. The researchers have now formulated tractable models for many of these problems. DTIC

N94-34208*# Texas Univ., Austin, TX.
AN HP ADAPTIVE DISCONTINUOUS GALERKIN METHOD FOR HYPERBOLIC CONSERVATION LAWS Ph.D. Thesis
Kim S. Bey Aug. 1994 140 p Sponsored by NASA. Langley Research Center
(NASA-TM-109848; NAS 1.15:109848) Avail: CASI HC A07/MF A02

This dissertation addresses various issues for model classes of hyperbolic conservation laws. The basic approach developed in this work employs a new family of adaptive, hp-version, finite element methods based on a special discontinuous Galerkin formulation for hyperbolic problems. The discontinuous Galerkin formulation admits high-order local approximations on domains of quite general geometry, while providing a natural framework for finite element approximations and for theoretical developments. The use of hp-versions of the finite element method makes possible exponentially convergent schemes with very high accuracies in certain cases; the use of adaptive hp-schemes allows h-refinement in regions of low regularity and p-enrichment to deliver high accuracy, while keeping problem sizes manageable and dramatically smaller than many conventional approaches. The use of discontinuous Galerkin methods is uncommon in applications, but the methods rest on a reasonable mathematical basis for low-order cases and has local approximation features that can be exploited to produce very efficient schemes, especially in a parallel, multiprocessor environment. The place of this work is to first and primarily focus on a model class of linear hyperbolic conservation laws for which concrete mathematical results, methodologies, error estimates, convergence criteria, and parallel adaptive strategies can be developed, and to then briefly explore some extensions to more general cases. Next, we provide preliminaries to the study and a review of some aspects of the theory of hyperbolic conservation laws. We also provide a review of relevant literature on this subject and on the numerical analysis of these types of problems. Derived from text

70 PHYSICS (GENERAL)

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

N94-33397 Wisconsin Univ., Milwaukee, WI. Dept. of Physics.
MICROFORCES IN ELECTROMIGRATION Final Report, Sep. 1989 - Oct. 1992
Richard S. Sorbello Dec. 1993 54 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F30602-89-C-0211; AF Proj. 2306)
(AD-A276229; RL-TR-93-228) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The following topics are discussed in the context of a theoretical description of electromigration (EM) in metallic microstructures: How EM in a small metallic system is affected by surfaces, interfaces, and extended defects e.g. grain boundaries and dislocations; Electronic aspects of EM and dynamical atom response to current emphasizing mesoscopic systems. Calculated local transport field in very small structures--near grain boundary or dislocation; Investigated inelastic scattering effects on electrical conductivity and EM of migrating impurity; Pauli-blocking effects induce nonlinearities in the electron and atom response; Investigated impurity heating by electron current, quantummechanical dynamics of interacting atom-lattice-electron system included; Net atom flux expressed in terms of effective driving force in Nernst-Einstein relation; Generalization to

non-adiabatic effects on electron screening and direct force for EM; Investigated dynamics in complementary classical diffusion processes; First numerical simulations of atomic level EM; and Significant enhancement of light interstitial EM from. DTIC

N94-35118# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: PHYSICS AND MATHEMATICS
4 Nov. 1993 31 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-93-003) Avail: CASI HC A03/MF A01

Translated articles cover the following topics: laser-acoustic cleaning of surfaces from mechanical microparticles; supersonic CO laser with HF excitation in combustion products; possibility of use of interaction between acoustic and light waves in fiber light conductors for generation of short light pulses; steady three-dimensional flow of viscous gas through channels and nozzles; current fluctuations in superconductor with superlattice in strong electric and magnetic fields; influence of strong electric field on conductivity of high-temperature superconductor ceramic of YBaCuO system; effect of electron bombardment on peak-effect in YBa2 Cu3Ox single crystals; and evolution of homogeneous isotropic universe, dark mass, and absence of monopoles. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation.
For noise pollution see *45 Environmental Pollution.*

N94-33425 Texas Univ., Austin, TX. Applied Research Lab.
BOTTOM BACKSCATTER FROM TRAPPED BUBBLES Final Report, 23 Dec. 1991 - 31 Dec. 1992
Frank A. Boyle and Nicholas P. Chotiros 30 Jul. 1993 47 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00039-91-C-0082)
(AD-A277583; ARL-TR-93-15) Avail: CASI HC A03

A model for acoustic backscatter from gas bubbles in sediment has been developed. It computes the backscattering strength of a gassy sediment, given a spherical source in the water column above. A Biot model for acoustic penetration into the sediment is incorporated. The computed backscattering strength is that of a spatial distribution of trapped bubbles. The bubble size distribution is assumed to mirror the pore size distribution. An approximate pore size distribution is estimated from the measured grain size distribution and studies of dense random packings of hard spheres. DTIC

N94-33579* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
FLYING ON THE GROUND (Videotape)
1991 Videotape: 11 min. 52 sec. playing time, in color, with sound
(NASA-TM-109825; NONP-VT-94-12953) Avail: CASI VHS A01/BETA A22

This video details research being conducted at LeRC on aircraft acoustics and the impact of aircraft noise on communities and passengers. The video describes LeRC researchers utilization of a laser Doppler velocimeter to study aircraft and the development of the Advanced Ducted Propeller. CASI

N94-33610*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A LABORATORY STUDY OF SUBJECTIVE ANNOYANCE RESPONSE TO SONIC BOOMS AND AIRCRAFT FLYOVERS
Jack D. Leatherwood and Brenda M. Sullivan May 1994 36 p
(RTOP 537-03-21-03)
(NASA-TM-109113; NAS 1.15:109113) Avail: CASI HC A03/MF A01

Three experiments were conducted to determine subjective equivalence of aircraft subsonic flyover noise and sonic booms. Two of the experiments were conducted in a loudspeaker-driven sonic boom simulator, and the third in a large room containing conventional loudspeakers. The sound generation system of the boom simulator had a frequency response extending to very low frequencies (about 1 Hz) whereas the large room loudspeakers were limited to about 20 Hz. Subjective equivalence between booms and flyovers was quantified in terms of the difference between the noise level of a boom and that of a flyover when the two were judged equally annoying. Noise levels were quantified in terms of the following noise descriptors: Perceived Level (PL), Perceived Noise Level (PNL), C-weighted sound exposure level (SELC), and A-weighted sound exposure level (SELA). Results from the present study were compared, where possible, to similar results obtained in other studies. Results showed that noise level differences depended upon the descriptor used, specific boom and aircraft noise events being compared and, except for the PNL descriptor, varied between the simulator and large room. Comparison of noise level differences obtained in the present study with those of other studies indicated good agreement across studies only for the PNL and SELA descriptors. Comparison of the present results with assessments of community response to high-energy impulsive sounds made by Working Group 84 of the National Research Council's Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) showed good agreement when boom/flyover noise level differences were based on SELA. However, noise level differences obtained by CHABA using SELA for aircraft flyovers and SELC for booms were not in agreement with results obtained in the present study. Author

N94-33685*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EVALUATION OF SEVERAL NON-REFLECTING COMPUTATIONAL BOUNDARY CONDITIONS FOR DUCT ACOUSTICS
Willie R. Watson, William E. Zorumski, and Steve L. Hodge May 1994 26 p
(RTOP 538-03-12-01)
(NASA-TM-109118; NAS 1.15:109118) Avail: CASI HC A03/MF A01

Several non-reflecting computational boundary conditions that meet certain criteria and have potential applications to duct acoustics are evaluated for their effectiveness. The same interior solution scheme, grid, and order of approximation are used to evaluate each condition. Sparse matrix solution techniques are applied to solve the matrix equation resulting from the discretization. Modal series solutions for the sound attenuation in an infinite duct are used to evaluate the accuracy of each non-reflecting boundary conditions. The evaluations are performed for sound propagation in a softwall duct, for several sources, sound frequencies, and duct lengths. It is shown that a recently developed nonlocal boundary condition leads to sound attenuation predictions considerably more accurate for short ducts. This leads to a substantial reduction in the number of grid points when compared to other non-reflecting conditions. Author

N94-33699 Department of the Navy, Washington, DC.
ENERGY ABSORPTION APPARATUS Patent Application
James M. Powers, inventor (to Navy), Mark B. Moffett, inventor (to Navy), and Stephen S. Gilardi, inventor (to Navy) 4 Jan. 1993 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016163; US-Patent-Appl-SN-000031; Navy-Case-74008) Avail: CASI HC A03

Apparatus for absorbing acoustic energy directed toward a wall is described. The apparatus includes a piezoelectric layer intermediate the wall and the source of the acoustic energy. Circuitry attached to the output of the transducer compensates blocked and motional capacitances of the transducer so that the output signal generates real current for dissipation in a resistor thereby to minimize any echo reflected from the piezoelectric layer. DTIC

N94-33836# Naval Research Lab., Bay Saint Louis, MS.
CLASSICAL SCATTERING THEORY OF WAVES FROM THE VIEW POINT OF AN EIGENVALUE PROBLEM AND APPLICATION TO TARGET IDENTIFICATION
C. Bottcher (Oak Ridge National Lab., TN.), M. R. Strayer (Oak Ridge National Lab., TN.), and M. F. Werby Apr. 1993 11 p Presented at the Third Automatic Object Recognition, 14-16 Apr. 1993
(AD-A277886; NRL/PP/7181-93-0036) Avail: CASI HC A03/MF A01

The Helmholtz Poincare Wave Equation (HPWE) arises in many areas of classical wave scattering theory. In particular it can be found for the cases of acoustical scattering from submerged bounded objects and electromagnetic scattering form objects. The extended boundary integral equations (EBIE) method is derived from considering both the exterior and interior solutions of the HPWE's. This coupled set of expressions has the

advantage of not only offering a prescription for obtaining a solution for the exterior scattering problem, but it also obviates the problem of irregular values corresponding to fictitious interior eigenvalues. Once the coupled equations are derived, they can be obtained in matrix form by expanding all relevant terms in partial wave expansions, including a biorthogonal expansion of the Green function. However, some freedom of choice in the choice of the surface expansion is available since the unknown surface quantities may be expanded in a variety of ways so long as closure is obtained. Out of many possible choices, we develop an optimal method to obtain such expansions which is based on the optimum eigenfunctions related to the surface of the object. In effect, we convert part of the problem (that associated with the Fredholms integral equation of the first kind) and eigenvalue problem of a related Hermition operator. The methodology will be explained in detail and examples will be presented. DTIC

N94-33858 Cornell Univ., Ithaca, NY. Dept. of Electrical Engineering.
MULTIPARAMETER BIFURCATIONS AND APPLICATIONS Final Report, 1 Dec. 1992 - 31 Aug. 1993
Allan Steinhardt 31 Aug. 1993 5 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-93-1-0054)
(AD-A278365; AFOSR-94-0170TR) Avail: CASI HC A01

New test statistics for signal detection with a multisensor array were developed. Bin grating was employed to exploit diversity in estimating noise covariance matrix (nuisance parameter). Work was performed on calibration of ULA's and invariant tests developed for the validation of optimal array configuration. DTIC

N94-33961# Institut de Recherche de Transports, Bron (France).
PROCEEDINGS OF THE 6TH INTERNATIONAL CONGRESS ON NOISE AS A PUBLIC HEALTH PROBLEM, VOLUME 1
Jul. 1993 96 p Congress held in Nice, France, 5-9 Jul. 1993 Sponsored by European Office of Aerospace Research and Development
(AD-A278259) Avail: CASI HC A05/MF A01

This volume is the first in a series of three reporting the proceedings of the 6th International Congress on Noise as a Public Health Problem which was held in Nice, France from the 5th to the 9th of July 1993. Volume 1 includes abstracts of the four main conferences and of 51 invited papers on the various effects of noise on people. It also includes the reflections of the European Community Commission (DG XI) and the World Health Organization concerning noise, together with 10 abstracts on the special workshop papers concerning control of damage to the ear and on sleep. DTIC

N94-34145# Swedish Inst. for Materials Testing, Boras (Sweden).
SURVEY METHOD FOR DETERMINING SOUND POWER LEVELS UNDER REVERBERANT CONDITIONS IN SITU: A PILOT STUDY. NORDTEST PROJECT 1064-92
H. G. Jonasson 1993 32 p
(PB94-149143; SP-RAPP-1993:53) Avail: CASI HC A03/MF A01

A pilot study, ISO 3746, which is a survey method for determining sound power levels employing an enveloping measurement surface over a reflecting plane, is modified to include measurements in the far field of a machine for different values of the environmental correction factor K(sub 2A). The equivalent sound absorption area is estimated from the guidelines given in ISO 3746. The results indicate that it is probably not necessary to have any upper limit of the allowable environmental correction and that it is often more convenient to measure in the reverberant field than it is to measure in the direct field on a measurement surface. The equivalent sound absorption area has been determined by using a reference sound source in a number of rooms. The results have been compared with those obtained by following ISO 3746. There seems to be a systematic overestimate of the sound absorption. Expressed in dB this overestimate is about 1 dB. The standard deviation is also about 1 dB. The main conclusion of this pilot project is that it should be possible to make a survey method using measurements in the far field and estimating the equivalent sound absorption area. Such a method should have a standard deviation of the reproducibility of about 3 dB. NTIS

N94-34157 Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
TIME-SCALE MODIFICATION OF COMPLEX ACOUSTIC SIGNALS IN NOISE
Thomas F. Quatieri, Robert B. Dunn, Robert J. McAulay, and Thomas E. Hanna 4 Feb. 1994 67 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F19628-90-C-0002)
(AD-A277535; TR-990; ESC-TR-93-263) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

A new approach is introduced for time-scale modification of short-duration complex acoustic signals to improve their audibility. The method preserves an approximate time-scaled temporal envelope of a signal, thus capitalizing on the perceptual importance of the signal's temporal structure, while also maintaining the character of a noise background. The basis for the approach is a subband signal representation, derived from a filter bank analysis/synthesis, the channel phases of which are controlled to shape the temporal envelope of the time-scaled signal. Channel amplitudes and filter bank inputs are selected to shape the spectrum and correlation of the time-scaled background. The phase, amplitude, and input control are derived from locations of events that occur within filter bank outputs. A frame-based generalization of the method imposes phase consistency and background noise continuity across consecutive synthesis frames. The approach and its derivatives are applied to synthetic and actual complex acoustic signals consisting of closely spaced sequential time components. DTIC

N94-34290# Institut de Recherche de Transports, Bron (France).
PROCEEDINGS OF THE 6TH INTERNATIONAL CONGRESS ON NOISE AS A PUBLIC HEALTH PROBLEM, VOLUME 2
9 Jul. 1993 671 p Congress held in Nice, France, 5-9 Jul. 1993 Sponsored by European Office of Aerospace Research and Development
(AD-A278217) Avail: CASI HC A99/MF A06

The 160 papers from the congress are presented. Topics covered include the following: noise induced hearing loss; noise and communication; community response to noise; noise and animal life; non-auditory physiological effects; influence of noise on performance and behavior; noise and disturbed sleep; and regulations and standards. DTIC

N94-34293# Maryland Univ., College Park, MD. Dept. of Electrical Engineering.
THEORETICAL AND EXPERIMENTAL STUDIES OF AUDITORY PROCESSING Annual Report, 1 Sep. 1992 - 31 Aug. 1993
Shihab Shamma and P. S. Krishnaprasad 30 Mar. 1994 4 p
(Contract F49620-92-J-0500)
(AD-A278505; AFOSR-94-0244TR) Avail: CASI HC A01/MF A01

Over the last year, work has progressed in the three basic areas that are emphasized in this proposal: (1) Peripheral auditory implementations; (2) Auditory cortical processing; and (3) Theoretical analysis of neural network architectures. In the first topic, we have completed a detailed analysis and implementation of the early auditory model originally formulated in the previous grant period. Specifically, we have determined the underlying mechanisms that give rise to noise robustness and self-normalization in the early auditory spectra. A patented VLSI implementation of the model has been accomplished. In the second area of research, we have completed a survey of response properties in the anterior auditory field, especially with regard to the cells' responses to FM and single tone stimuli. Finally, in the third focus area, we have developed new recursive algorithms (mimicing recursive neural network architectures) for building systematically, approximate basis function representations. The new algorithms known as orthogonal matching pursuit algorithms are applicable to a wide class of problems, ranging from fitting radial basis function approximations to wavelet-bases models for transfer functions of linear systems. DTIC

N94-34303*# Georgia Inst. of Tech., Atlanta, GA.
A REVIEW OF AN UPDATED SYNTHESIS OF NOISE/ANNOYANCE RELATIONSHIPS Final Report
James M. Fields Jul. 1994 92 p
(Contract NAS1-19061; RTOP 538-03-15-01)
(NASA-CR-194950; NAS 1.26:194950) Avail: CASI HC A05/MF A01

This report evaluates the evidence supporting the 'dosage-effect relationship for the prevalence of annoyance due to general transportation noise' that was originally presented in 1978 and more recently updated in

1991. The synthesis methods and many of the constituent studies' reports are examined. The weaknesses of the synthesis are identified and found to be partly due to the synthesis methodology, but fundamentally to the lack of comparability in the constituent studies' methodologies and reporting procedures. Several suggested improvements to survey, analysis, and synthesis techniques are proposed. Author (revised)

N94-34305*# Old Dominion Univ., Norfolk, VA. Dept. of Aerospace Engineering.
ANALYSIS OF RANDOM STRUCTURE-ACOUSTIC INTERACTION PROBLEMS USING COUPLED BOUNDARY ELEMENT AND FINITE ELEMENT METHODS Technical Report, 16 Dec. 1991 - 15 Jun. 1994
Chuh Mei and Carl S. Pates, III Jun. 1994 147 p
(Grant NAG1-1358)
(NASA-CR-195931; NAS 1.26:195931) Avail: CASI HC A07/MF A02

A coupled boundary element (BEM)-finite element (FEM) approach is presented to accurately model structure-acoustic interaction systems. The boundary element method is first applied to interior, two and three-dimensional acoustic domains with complex geometry configurations. Boundary element results are very accurate when compared with limited exact solutions. Structure-interaction problems are then analyzed with the coupled FEM-BEM method, where the finite element method models the structure and the boundary element method models the interior acoustic domain. The coupled analysis is compared with exact and experimental results for a simplistic model. Composite panels are analyzed and compared with isotropic results. The coupled method is then extended for random excitation. Random excitation results are compared with uncoupled results for isotropic and composite panels. Author

N94-34380# Harris, Miller, Miller and Hanson, Inc., Lexington, MA.
DOSE-RESPONSE RELATIONSHIPS DERIVED FROM DATA COLLECTED AT GRAND CANYON, HALEAKALA AND HAWAII VOLCANOES NATIONAL PARKS
Grant S. Anderson, Richard D. Horonjeff, Christopher W. Menge, Nicholas P. Miller, William E. Robert, Christopher Rossano, Gonzalo Sanchez, Robert M. Baumgartner, and Cary McDonald Oct. 1993 258 p See also PB94-149986
(Contract NPS-CX-2000-0-0025)
(PB94-151941; HMMH-290940.14; NPOA-93-6) Avail: CASI HC A12/MF A03

The basic goal of the study was to develop a quantitative relationship between the sound produced by aircraft overflights (the dose) and the reactions of visitors (response) to this sound. The dose-response relationships were developed by measuring sound levels in an area of a park while simultaneously interviewing visitors who had passed through or visited that area. Though many types of dose and response were measured, the analysis and discussions led to selection of two types of dose (aircraft L and percent time aircraft are audible) and two types of response (percent of visitors annoyed and percent of visitors who judged that the sound from aircraft interfered with their appreciation of natural quiet) for development of the final dose-response relationships. These dose response relationships may be used to both (1) identify sites that experience impacts from the sound of aircraft overflights and (2) judge the change in impacts likely to result from some alteration in the sound of overflights. NTIS

N94-34393*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INTRODUCTION TO GENERALIZED FUNCTIONS WITH APPLICATIONS IN AERODYNAMICS AND AEROACOUSTICS
F. Farassat May 1994 52 p
(RTOP 535-03-11-02)
(NASA-TP-3428; L-17300; NAS 1.60:3428) Avail: CASI HC A04/MF A01

Generalized functions have many applications in science and engineering. One useful aspect is that discontinuous functions can be handled as easily as continuous or differentiable functions and provide a powerful tool in formulating and solving many problems of aerodynamics and acoustics. Furthermore, generalized function theory elucidates and unifies many ad hoc mathematical approaches used by engineers and scientists. We define generalized functions as continuous linear functionals on the space of infinitely differentiable functions with compact support, then introduce the concept of generalized differentiation. Generalized differentiation is the most important concept in generalized function theory and the applications we present utilize mainly this concept. First, some results of classical analysis, are derived with the generalized function theory. Other applications of the generalized function theory in aerodynamics discussed here are the derivations of general transport theorems for deriving governing equations of fluid mechanics, the interpretation of the finite part of divergent integrals, the derivation of the Oswatitsch integral equation of transonic flow, and the analysis of velocity field discontinuities as sources of vorticity. Applications in aeroacoustics include the derivation of the Kirchhoff formula for moving surfaces, the noise from moving surfaces, and shock noise source strength based on the Ffowcs Williams-Hawkings equation. Author

N94-33464*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HIGH SPEED JET NOISE RESEARCH AT NASA LEWIS
Eugene A. Krejsa, B. A. Cooper, C. M. Kim, and Abbas Khavaran *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 519-532 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33465*# Pratt and Whitney Aircraft, East Hartford, CT.
HSCT NOZZLE SOURCE NOISE PROGRAMS AT PRATT AND WHITNEY
Alfred M. Stern *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 535-549 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33466*# General Electric Co., Cincinnati, OH. Aircraft Engines.
HSCT NOISE REDUCTION TECHNOLOGY DEVELOPMENT AT GE AIRCRAFT ENGINES
Rudramuni K. Majjigi *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 553-589 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33467*# Boeing Commercial Airplane Co., Seattle, WA.
COMMUNITY NOISE SOURCES AND NOISE CONTROL ISSUES
Gene L. Nihart *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 593-606 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33469*# Florida State Univ., Tallahassee, FL. Dept. of Mathematics.
THEORETICAL ASPECTS OF SUPERSONIC JET NOISE
Christopher K. W. Tam *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 647-662 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33470*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
DESIGN AND ANALYSIS OF LOW BOOM CONCEPTS AT LANGLEY RESEARCH CENTER
Christine M. Darden, Robert J. Mack, Kathy E. Needleman, Daniel G. Baize, Peter G. Coen, Raymond L. Barger, N. Duane Melson, Mary S. Adams, Elwood W. Shields, and Marvin E. McGraw *In its* First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 675-699 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33472*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SONIC BOOM PREDICTION AND MINIMIZATION USING COMPUTATIONAL FLUID DYNAMICS
Thomas A. Edwards, Raymond Hicks, Samson Cheung, Susan Cliff-Hovey, Mike Madson, and Joel Mendoza *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 723-738 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33474*# Grumman Aerospace Corp., Bethpage, NY.
SONIC BOOM PREDICTIONS USING A MODIFIED EULER CODE
Michael J. Siclari *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 759-784 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33475*# Eagle Engineering, Inc., Hampton, VA.
OVERVIEW OF FEASIBILITY STUDY ON CONDUCTING OVERFLIGHT MEASUREMENTS OF SHAPED SONIC BOOM SIGNATURES USING RPV'S
Domenic J. Maglieri, Victor E. Sothcott, Thomas N. Keefer, Jr., and Percy J. Bobbitt *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 787-807 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

N94-33489*# Lockheed Aeronautical Systems Co., Marietta, GA.
NEW BROADBAND SHOCK NOISE MODEL AND COMPUTER CODE FOR ANOPP
N. N. Reddy *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1075-1101 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33490*# Boeing Commercial Airplane Co., Seattle, WA.
COMMUNITY NOISE TECHNOLOGY NEEDS: BOEING'S PERSPECTIVE
Gene L. Nihart *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1105-1119 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33491*# Douglas Aircraft Co., Inc., Long Beach, CA.
AERO ACOUSTIC ANALYSIS AND COMMUNITY NOISE. HSCT CLIMB TO CRUISE NOISE ASSESSMENT
Alan K. Mortlock *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1123-1133 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33492*# Lockheed Engineering and Sciences Co., Hampton, VA.
ANOPP/VMS HSCT GROUND CONTOUR SYSTEM
John Rawls, Jr. and Lou Glaab *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1137-1157 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33493*# Lockheed Engineering and Sciences Co., Hampton, VA.
HIGH PERFORMANCE JET-ENGINE FLIGHT TEST DATA BASE FOR HSR
Jeffrey Kelly *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1161-1177 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33494*# Lockheed Engineering and Sciences Co., Hampton, VA.
STATUS AND PLANS FOR THE ANOPP/HSR PREDICTION SYSTEM
Sandra K. Nolan *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1181-1196 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33495*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ATMOSPHERIC EFFECTS ON SONIC BOOM: A PROGRAM REVIEW
Gerry L. McAninch *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1201-1207 (For primary document see N94-33487 10-02)
Avail: CASI HC A02/MF A06

N94-33496*# Pennsylvania State Univ., University Park, PA. Graduate Program in Acoustics.
RELAXATION AND TURBULENCE EFFECTS ON SONIC BOOM SIGNATURES
Allan D. Pierce and Victor W. Sparrow *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1211-1240 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33497*# Wyle Labs., Inc., Arlington, VA.
THE EFFECT OF TURBULENCE AND MOLECULAR RELAXATION ON SONIC BOOM SIGNATURES
Kenneth J. Plotkin *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1243-1262 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33498*# Mississippi Univ., University, MS. Physical Acoustics Research Group.
STATISTICAL AND NUMERICAL STUDY OF THE RELATION BETWEEN WEATHER AND SONIC BOOM CHARACTERISTICS
Lixin Yao, Henry E. Bass, Richard Raspet, and Walton E. McBride *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1265-1283 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33500*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SONIC BOOM ACCEPTABILITY STUDIES
Kevin P. Shepherd, Brenda M. Sullivan, Jack D. Leatherwood, and David A. McCurdy *In its* First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1295-1311 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33501*# Georgia Inst. of Tech., Atlanta, GA.
GEORGIA TECH SONIC BOOM SIMULATOR
Krish K. Ahuja *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1315-1342 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-33502*# Wyle Labs., Inc., El Segundo, CA.
SONIC BOOM (HUMAN RESPONSE AND ATMOSPHERIC EFFECTS) OUTDOOR-TO-INDOOR RESPONSE TO MINIMIZED SONIC BOOMS
David Brown and Louis C. Sutherland *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 3 Apr. 1992 p 1345-1363 (For primary document see N94-33487 10-02)
Avail: CASI HC A03/MF A06

N94-34372# Nanjing Aeronautical Inst. (China). Dept. of Mechanical Engineering.
A STUDY ON ADAPTIVE ACTIVE NOISE CONTROL
W. M. Wu, N. L. Tan, H. Ren, and S. L. Chen *In its* Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 286-290 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

N94-33540 California Univ., Davis, CA. Dept. of Chemistry.
THE KINETICS OF HETEROGENEOUS ELECTRON TRANSFER REACTIONS IN POLAR SOLVENTS Technical Report No. 7
W. R. Fawcett and M. Opallo 20 Apr. 1994 58 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-93-1-0351)
(AD-A278459) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Data for heterogeneous electron transfer reactions obtained in the last ten years have been examined within the context of contemporary theory. Special attention is focussed on systems for which rate constants and activation parameters are available as a function of the solvent, and as a function of temperature. The role of reactant structure in determining the kinetic parameters is also considered. Double layer effects both at unmodified and modified electrodes are discussed in detail. Experimental techniques, especially those suited to measuring fast reactions, are also outlined. DTIC

N94-33684 Oak Ridge National Lab., TN.
SLOW COLLISIONS OF MULTICHARGED IONS WITH METAL SURFACES
F. W. Meyer 1993 12 p Presented at the 9th Biennial Topical Conference on Atomic Processes in Plasmas, San Antonio, TX, 19-23 Sep. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC05-84OR-21400)
(DE94-009449; CONF-9309119-6) Avail: CASI HC A03

Some recent experimental results in the area of multicharged ion-surface interactions are summarized. Discussed are measurements of projectile K-Auger electron emission during interactions of hydrogen-like multicharged ions with clean and cesiated metal surfaces, measurements of total electron yields for various multicharged ions incident on metal targets, and measurements of projectile angular scattering during grazing metal surface collisions. The various experimental results are presented to illustrate progress in the understanding of multicharged ion-surface interactions in the area of above versus sub-surface neutralization and relaxation processes, as well as to identify certain aspects of such interactions where the picture is as yet still incomplete. DOE

N94-33716# Oak Ridge National Lab., TN.
USING NEURAL NETWORKS AS AN EVENT TRIGGER IN ELEMENTARY PARTICLE PHYSICS EXPERIMENTS
E. Neis (Tennessee Univ., Knoxville.), F. W. Starr (Tennessee Univ., Knoxville.), T. Handler (Tennessee Univ., Knoxville.), T. Gabriel, C. Glover, and S. Saini 1994 5 p Presented at the IEEE World Congress on Computational Intelligence, Lake Buena Vista, FL, 28 Jun. - 2 Jul. 1994
(Contract DE-AC05-84OR-21400)
(DE94-006316; CONF-940699-1) Avail: CASI HC A01/MF A01

Elementary particle physics experiments often have to deal with high data rates. In order to avoid having to write out all data that is occurring online processors, triggers, are used to cull out the uninteresting data. These triggers are based on some particular aspect of the physics being examined. At times these aspects are often equivalent to simple pattern recognition problems. The reliability of artificial neural networks (ANN's) in pattern recognition problems in many fields has been well demonstrated. We present here the results of a study on the feasibility of using ANN's as an online trigger for high energy physics experiments. DOE

N94-33745 Denver Univ., CO. Dept. of Chemistry.
REACTIONS AND SPECTROSCOPY OF EXCITED NITRENES Final Report, 1 May 1992 - 31 Oct. 1993
Robert D. Coombe 28 Jan. 1994 41 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0270)
(AD-A278475; AFOSR-94-0145TR) Avail: CASI HC A03

This report describes the results of an 18 month research program in which reactions and energy transfer processes involving excited NCl(a(sup 1) Delta) were investigated. The work included three projects. In the first of these, high densities (greater than 10(exp 15/cu cm)) of NCl(a(sup 1) Delta) were produced by photodissociation of ClN3, and excited I(5(sup 2) P(sub 1/2)) atoms were generated by a subsequent energy transfer process. The data suggest that a population inversion on the I(5(sup 2) P(sub 1/2)) - I(5(sup 2) P(sub 3/2)) transition was achieved, but the inversion density was insufficient to reach laser threshold in the optical cavity employed. In the second project, rate constants for collisional quenching of NCl(a(sup 1) Delta) by a number of atoms and diatomic molecules were measured. In the third project, the production of NCl(a(sup 1) Delta) by the H + NCl2 reaction was investigated in a continuous transverse-flow reactor at high reagent densities. DTIC

N94-33863# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
ABOUT G-parity VIOLATION IN TAU YIELDS NU PI ETA DECAY
V. A. Bednyakov 1992 8 p
(DE94-611146; JINR-E-2-92-168) Avail: CASI HC A02/MF A01 (US Sales Only)

The characteristics of the G-parity forbidden tau yields nu(pi)eta decay were calculated in the phenomenological quark model with allowance for isospin symmetry violation. DOE

N94-33864# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ON A COMPLEX VACUUM STRUCTURE IN NON-ABELIAN GAUGE THEORIES AND ON THE PLACE OF MAJORANA PARTICLES IN THESE THEORIES
Kh. M. Beshtoev 1992 7 p
(DE94-611147; JINR-E-2-92-195) Avail: CASI HC A02/MF A01 (US Sales Only)

It is shown that a complex vacuum structure is impossible in SU(N) gauge theories. The complex vacuum structure appears in extended theories with complex vector fields. It is shown that Majorana particles cannot exist in standard SU(N) gauge-invariant theories. DOE

N94-33869# Japan Atomic Energy Research Inst., Tokyo (Japan).
ANALYSIS OF STOCHASTIC PARTICLE BEHAVIOR IN A MAGNETIC ISLAND DUE TO ELECTROSTATIC DRIFT WAVES
Yasutaro Nishimura, Masafumi Azumi, Masatoshi Yagi, Kiyotaka Hamamatsu, Keiji Tani, Shigefumi Okada, and Seiichi Goto Jul. 1993 59 p
(DE94-727553; JAERI-M-93-140) Avail: CASI HC A04/MF A01

Stochastic particle motion in the magnetic island in the presence of electrostatic perturbations has been studied both numerically and analytically. By evaluating the K-S entropy, it was shown that particle orbits can be stochastic by the simultaneous effects of magnetostatic perturbation and electrostatic ones with amplitudes which are not large enough to induce the orbit stochasticity alone. The generation of orbit stochasticity is due to the overlapping of sub-island formed by the E B drift driven by electrostatic perturbations and is consistent with Chirikov criterion. For the given perturbed energy, the wide region in the particle orbit can be stochastic by the electrostatic perturbations with adjacent resonance surfaces and successive mode numbers, rather than the single perturbation with large amplitude. The particle diffusion process was also analyzed by evaluating the cummulants of particle displacement in time and it was shown that the process is basically the Gauss one and, for the higher order cummulants, that the second one appeared due to the spatial inhomogeneity of the local diffusion coefficient. DOE

N94-33882# Flinders Univ., Adelaide (Australia). Electronic Structure of Materials Centre.
CONVERGENT CLOSE-COUPLING CALCULATIONS OF LOW-ENERGY POSITRON-ATOMIC-HYDROGEN SCATTERING
I. Bray and A. T. Stelbovics Jul. 1993 7 p
(DE94-609858; ESM-56) Avail: CASI HC A02/MF A01 (US Sales Only)

The convergent close coupling approach developed by the authors is applied to positron scattering from atomic hydrogen below the first excitation threshold. In this approach the multi-channel expansion one-electron states are obtained by diagonalizing the target Hamiltonian in a large Laguerre basis. It is demonstrated that this expansion of the scattering wave function is sufficient to reproduce the very accurate low-energy variational results, provided target states with l less than or equal to 15 are included in the expansions. DOE

N94-33896 Texas Univ., Austin, TX.
CALCULATION OF PHASE STABILITY IN Zr-Nb-Ru USING LMTO AND THE CLUSTER VARIATION METHOD Ph.D. Thesis
John D. Becker Dec. 1993 154 p Sponsored by ONR Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(AD-A278556) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Progress in a long-standing objective in computational materials science, the calculation of alloy phase diagrams from first-principles, has been paced by the associated problems of accurate yet efficient total-energy calculations and statistical approximations of the alloy partition function. The former is well understood, and the evolution of Density-Functional Theory (DFT) to computationally suitable methods using the Local-Density Approximation (LDA) is a reknowned (though, argueably, a qualified) success. The high precision required of the total-energy band-structure methods for phase-equilibrium calculations is attainable for most chemical systems. The connection between the total-energy calculations and a general solution to the Ising problem is provided by a cluster expansion in a series of multi-atom interaction energies. This rigorous expansion may be inverted to calculate the total energy of any lattice configuration using the multi-atom interactions. Two main aspects of the cluster expansion method remain unresolved: the convergence of the expansion and the effect of strain energy on the convergence. These two issues are central to this thesis, and a major portion of this study is devoted toward a resolution. DTIC

N94-33923# Texas Univ., Austin, TX. Dept. of Physics.
MEDIUM ENERGY MEASUREMENTS OF N-N PARAMETERS
D. Ambrose, M. Bachman, P. Coffey, G. Glass, B. Jobst, Kok Heong McNaughton, Chau Nguyen, and P. J. Riley 1 Oct. 1993 83 p
(Contract DE-FG05-88ER-40446)
(DE94-008340; DOE/ER-40446/T1) Avail: CASI HC A05/MF A01

Most of the effort was devoted to the study of nucleon-nucleon interactions, specifically, spin transfer measurements in np elastic scattering at LAMPF, pp elastic differential cross section measurements at LAMPF, and single-pion production in np scattering. Differential cross sections and analyzing powers are shown for np yields pp(pi)(sup -) interactions. A new search for rare K(sub L)(sup 0) decays to (mu)e, mu(mu), and ee is being undertaken. Collaborative work has been begun on a very large, complex collider detector STAR (Solenoidal Tracker At RHIC). STAR is envisioned as a combination of a silicon vertex tracker, a time projection chamber, a set of trigger scintillators, and time-of-flight counters. It would allow measurements of spin dependence at p(sub T) above 10 GeV/c. DOE

N94-33935# Japan Atomic Energy Research Inst., Tokyo (Japan).
CHARGE-CHANGING COLLISION CROSS SECTIONS OF LOW-ENERGY CARBON IONS WITH CARBON CONTAINING MOLECULES
Nariaki Hamamoto, Takashi Tanaka, Akio Itoh, Nobutsugu Imanishi, Manabu Saito, Yoichi Haruyama, and Toshizo Shirai Oct. 1993 51 p
(DE94-727628; JAERI-M-93-202) Avail: CASI HC A04/MF A01

Cross sections of single-, double-, and three-electron capture collisions have been measured for the carbon ions passing through the CO2, CH4, C2H6, and C3H8 gas targets at energies between 0.5 and 5 keV/amu. Errors of the obtained cross sections are estimated to be 9 to 20 percent. The cross sections hardly depend on incident energy in the present energy region, but depend on charge of the incident particles and ionization potential of the target molecules. Multiple-electron transfer processes are predominant in these complex molecules. The results of single-electron capture process are discussed in a comparison with theoretical models. DOE

N94-33936# Brookhaven National Lab., Upton, NY.
SPIN AND PRECISION ELECTROWEAK PHYSICS
W. J. Marciano 1993 43 p Presented at the 21st Annual SLAC Summer Institute on Particle Physics: Spin Structure in High-Energy Processes, Stanford, CA, 26 Jul. - 6 Aug. 1993
(Contract DE-AC02-76CH-00016)
(DE94-009074; BNL-60177; CONF-930767-4) Avail: CASI HC A03/MF A01

A perspective on fundamental parameters and precision tests of the Standard Model is given. Weak neutral current reactions are discussed with emphasis on those processes involving polarized electrons. The role of electroweak radiative corrections in determining the top quark mass and probing for 'new physics' is described. DOE

N94-33994 Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study.
PION-NUCLEON INTERACTION IN NUCLEAR MATTER ABOVE THE DELTA RESONANCE ENERGY
Masaki Arima (Sophia Univ., Tokyo, Japan.), Keiichi Masutani (Yamanashi Univ., Kofu, Japan.), and Ryoichi Seki (Tokyo Univ., Japan.) Apr. 1993 40 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE94-727455; INS-971) Avail: CASI HC A03

We investigate the pi-nucleus interaction for 600-900 MeV/c by microscopically examining dynamical modifications of N(sup *) resonances in nuclear matter. The pion production through the pi(Delta) channel is appreciably suppressed in nuclei because the pion produced suffers strong distortion by a Delta formation with a neighboring nucleon. This effect makes the width of N(1520) smaller and the mass larger in nuclei than in free space, and the (pi)N D(sub 13)-wave amplitude loses much of its inelasticity in nuclei. A similar situation arises with N(1535) and the (pi)N S(sub 11)-wave amplitude because the (eta)N channel is suppressed by Pauli blocking on the nucleon accompanying eta. These effects, however, change the pi-nucleus elastic-scattering cross sections by only a small amount because of Fermi averaging. They may appear significantly in some inelastic reactions. Spreading potential makes the width of N(sup *) larger and counteracts the pion-production suppression, but it cannot explain the puzzling disagreement between the data and the calculations. DOE

N94-34089# Los Alamos National Lab., NM.
THE PS 200 CATCHING TRAP: A NEW TOOL FOR ULTRA-LOW ENERGY ANTIPROTON PHYSICS
M. H. Holzscheiter, P. L. Dyer, N. S. P. King, D. C. Lizon, G. L. Morgan, M. M. Schauer, J. A. Schecker, S. Hoibraten, R. A. Lewis, and T. Otto 1994 32 p Presented at the 1993 NAN, Nucleon-Antinucleon Physics, Moscow, Russia, 11-19 Sep. 1993
(Contract W-7405-eng-36)
(DE94-009309; LA-UR-94-830; CONF-9309360-1) Avail: CASI HC A03/MF A01

Approximately one million antiprotons have been trapped and electron cooled in the PS200 catching trap from a single fast extracted pulse from LEAR. The system is described in detail, different extraction schemes are discussed, and possible applications of this instrument to ultra-low energy atomic and nuclear physics with antiprotons are mentioned. DOE

N94-34100# Minnesota Univ., Minneapolis, MN. School of Physics and Astronomy.
THEORETICAL STUDY OF REACTIONS AT THE ELECTRODE-ELECTROLYTE INTERFACE
J. W. Halley 1994 6 p
(Contract DE-FG02-91ER-45455)
(DE94-009658; DOE/ER-45455/2) Avail: CASI HC A02/MF A01

Electron transfer rates are predicted by numerical methods, in collaboration with ANL. Emphasis is on electron transfer involving ions known to be important in enhancing stress corrosion cracking in light water reactors and on electron transfer at oxide surfaces. We have completed studies of the ferrous-ferric electron transfer rate in which effects of electric field, entropic effects in the free energy, and quantum effects are included for the first time in the calculation of the rate of an electrochemical (heterogeneous) reaction rate. These new results confirm assumptions made in earlier calculations. The ferric ion has been modeled in a dissociable polarizable model showing the six-fold coordination of this ion in aqueous solution is stabilized by the three body interactions arising from the polarizability of water. In our studies of oxides, we have completed a Hartree self consistent calculation of the electronic structure of fayalite. The calculation utilizes a new method which takes phenomenological account of local electron correlations which have plagued electronic structure calculations of oxides for a long time. No electronic structure calculation of fayalite has been previously reported to our knowledge. Similar methods have been used to calculate the electronic structure of a vacancy in rutile (TiO2). Results show that the screening donor electrons are anisotropically distributed around the vacancy. DOE

N94-34168# Lawrence Livermore National Lab., CA.
STUDIES OF ION ACOUSTIC DECAY
R. P. Drake, B. S. Bauer, and K. L. Baker Mar. 1994 16 p
(Contract W-7405-eng-48)
(DE94-009470; UCRL-ID-116311) Avail: CASI HC A03/MF A01

In this project, we advanced knowledge of Ion Acoustic Decay on several fronts. In this project, we have developed and demonstrated the capability to perform experimental and theoretical studies of the ion acoustic

decay instability. We have at the same time demonstrated an improved capability to do multichannel spectroscopy and Thomson scattering. We made the first observations of the time-resolved second harmonic emission at several angles simultaneously, and the first observations of the emission both parallel and perpendicular to the electric field of the laser light. We used Thomson scattering to make the first observations of the plasma waves driven by acoustic decay in a warm plasma with long density scale lengths. We also advanced both the linear and the nonlinear theory of this instability. We are thus prepared to perform experiments to address this mechanism as needed for applications. DOE

N94-34242# Argonne National Lab., IL.
COMMENT ON OBSERVATION OF THE STRIKING DEPARTURE FROM VELOCITY PROPORTIONALITY IN LOW-ENERGY ELECTRONIC STOPPING
M. Kimura 1994 3 p
(Contract W-31-109-eng-38)
(DE94-009821; ANL/ER/PP-73234) Avail: CASI HC A01/MF A01

On their recent energy loss measurement of a hydrogen projectile in He gas, Golser and Semrad reported a significant deviation below 20 keV of the electronic stopping cross section from the projectile velocity v-proportionality. The common argument of the v-proportionality of the electronic stopping cross section at low energy is based on the constant-density electron-gas model of Lindhard and Scharff. The purpose of this comment is to point out two considerations. First, inelastic process in ionic collisions at low to intermediate energies (below approximately 25 keV/amu) are now well recognized by atomic physicists because of complex events in which many channels simultaneously interplay as a sensitive function of a combination of collision energy, coupling strengths, and energy defects among relevant channels as collision dynamics significantly vary from one system to another. Therefore, a simple model such as an electron-gas model would not be expected to provide universally accurate results for inelastic cross sections or stopping cross sections in this energy regime. Consequently, the v-proportionality is no longer always valid. Second, the general trend found by Golser and Semrad can be reasonably well reproduced by reconstructing stopping cross sections of He and H2 for protons from compiled cross section data and supplemental calculations. DOE

N94-34383# Los Alamos National Lab., NM.
IDENTIFICATION OF ELECTRONIC TRANSITIONS IN POLYACETYLENE BY ACOUSTIC PHONON SPECTROSCOPY
G. S. Kanner, G. Lanzani, and Z. V. Vardeny 1994 5 p Presented at the 2nd International Topical Conference on Optical Probes of Conjugated Polymers and Fullerenes, Salt Lake City, UT, 16-19 Feb. 1994
(Contract W-7405-eng-36)
(DE94-009324; LA-UR-94-1114; CONF-940262-3) Avail: CASI HC A01/MF A01

We have found that a strain-induced oscillation in the decay of the picosecond photoinduced absorption of polyacetylene (CH)(sub x) can be used to identify the allowed and forbidden electronic transitions in that polymer. DOE

N94-34945*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A SPECTRAL ATLAS OF THE NU(SUB 12) FUNDAMENTAL OF (13)C(12)CH6 IN THE 12 MICRON REGION
Mark Weber, Dennis C. Reuter, J. Marcos Sirota, William E. Blass, and John J. Hillman May 1994 179 p
(RTOP 693-00-00)
(NASA-TM-104601; Rept-94B00067; NAS 1.15:104601) Avail: CASI HC A09/MF A02

The recent discovery of the minor isotopomer of ethane, (13)C(12)CH6, in the planetary atmospheres of Jupiter and Neptune, added ethane to the molecules which can be used to determine isotopic (12)C(12)C ratios for the jovian planets. The increased spectral resolution and coverage of the IR and far-IR instruments to be carried on the Cassini mission to Saturn and Titan may enable the detection of the minor isotopomer. Accurate frequency and cross-section measurements of the nu(sub 12) fundamental under controlled laboratory condition are important to interpret current and future planetary spectra. High resolution spectra of the minor isotopomer (13)C(12)CH6 have been recorded in the 12.2 micron region using the Kitt Peak Fourier Transform (FTS) and the Goddard Tunable Diode Laser spectrometer (TDL). In a global fit to 19 molecular constants in a symmetric top Hamiltonian, transition frequencies of the nu(sub 12) fundamental ranging up to J=35 and K=20 have been determined with a standard deviation of less than 0.0005 cm(exp -1). From selected line intensity measurements, a vibrational dipole moment for the nu(sub 12) fundamental has been derived. Observed and calculated spectra covering the region from 740 cm(exp -1) and to 910 cm(exp -1) are presented. A compilation of transition frequencies, line intensities, and lower state energies are included for general use in the astronomical community. Author

N94-35073 Fermi National Accelerator Lab., Batavia, IL.
MEASUREMENT OF THE RATIO R = (SIGMA X B(p(BAR p) YIELDS W(SUP (+-)) YIELDS e(SUP(+-))(NU)))/(SIGMA X B(p(BAR p) YIELDS Z(SUP 0) YIELDS e(SUP +e(SUP -)) IN p(BAR p) COLLISIONS AT THE SQUARE ROOT OF s = 1,800 GeV
Aug. 1993 13 p Presented at the 16th International Symposium on Lepton and Photon Interactions, Ithaca, NY, 10-15 Aug. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC02-76CH-03000)
(DE94-006846; FNAL/C-93/210-E; CONF-930823-21) Avail: CASI HC A03

The authors present preliminary results on the measurement of the ratio of W and Z cross sections in p(bar-p) collisions at (radical)s = 1,800 GeV in the electron decay channel. The data represent approximately 18.4 pb(exp -1) from the 1992-1993 run of the Collider Detector at Fermilab. They find R = 10.64 (+/-) 0.36 (stat.) (+/-) 0.27 (sys.). From this value they extract a value for the ratio of W and Z total decay widths, (Gamma)(W)/(Gamma)(Z), and set a model-independent limit on the top quark mass m(sub top). DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*.

N94-33682 Stanford Univ., CA. Linear Accelerator Center.
SIMULATION OF THE BEAM HALO FROM THE BEAM-BEAM INTERACTION IN LEP
T. Chen, J. Irwin, and R. Siemann Feb. 1994 4 p Presented at the 4th Annual LEP Performance Workshop, Chamonix, France, 17-21 Jan. 1994 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC03-76SF-00515)
(DE94-009097; SU-SLAC-PUB-6432; CONF-940174-1) Avail: CASI HC A01

The luminosity lifetimes of e(+)e(-) colliders are often dominated by the halo produced by the beam-beam interaction. They have developed a simulation technique to model this halo using the flux across boundaries in amplitude space to decrease the CPU time by a factor of one-hundred or more over 'brute force' tracking. It allows simulation of density distributions and halos corresponding to realistic lifetimes. Reference 1 shows the agreement with brute force tracking in a number of cases and the importance of beam-beam resonances in determining the density distribution of large amplitudes. This research is now directed towards comparisons with operating colliders and studies of the combined effects of lattice and beam-beam nonlinearities. LEP offers an ideal opportunity for both, and in this paper they are presenting the first results of LEP simulations. DOE

N94-33844# California Univ., Los Angeles, CA. Dept. of Physics.
EXPERIMENTAL AND THEORETICAL HIGH ENERGY PHYSICS RESEARCH
D. B. Cline 1 Oct. 1993 82 p
(Contract DE-FG03-91ER-40662)
(DE94-008339; DOE/ER-40662/T2) Avail: CASI HC A05/MF A01

Progress on seven tasks is reported. (1) UCLA hadronization model, antiproton decay, PEP4/9 e(+)e(-)) analysis: In addition to these topics, work on CP and CPT phenomenology at a phi factory and letters of support on the hadronization project are included. (2) ICARUS detector and rare B decays with hadron beams and colliders: Developments are

summarized and some typical events as shown; in addition, the RD5 collaboration at CERN and the asymmetric phi factory project are sketched. (3) Theoretical physics: includes Feynman diagram calculations in gauge theory; supersymmetric standard model; effects of quantum gravity in breaking of global symmetries; models of quark and lepton substructure; renormalized field theory; large-scale structure in the universe; and particle-astrophysics/early universe cosmology. (4) H dibaryon search at BNL, kaon experiments (E799/KTeV) at Fermilab: Project design and some scatterplots are given. (5) UCLA participation in the experiment CDF at Fermilab. (6) Detectors for hadron physics at ultrahigh energy colliders: Scintillating fiber and visible light photon counter research. (7) Administrative support and conference organization. DOE

N94-33876# Stanford Linear Accelerator Center, CA.
THE e(+)e(-) COLLISIONS AT THE SLC: THE LEFT-RIGHT ASYMMETRY
G. Shapiro (California Univ., Berkeley. Lawrence Berkeley Lab, CA.) Feb. 1994 13 p Presented at the 5th International Workshop on High Energy Spin Physics, Protvino, Russia, 20-24 Sep. 1993
(Contract DE-AC03-76SF-00515)
(DE94-009031; SU-SLAC-PUB-6444; LBL-35168; CONF-9309323-3) Avail: CASI HC A03/MF A01

The Stanford Linear Collider has operated successfully to produce over 50,000 Z(sup O)'s with polarized electron beams. The asymmetry in the production of Z(sup O)'s with respect to left and right handed electron beams was measured, and a preliminary result is presented. DOE

N94-33907# Los Alamos National Lab., NM.
SEARCH FOR NEUTRONS FROM DEUTERATED PALLADIUM SUBJECT TO HIGH ELECTRICAL CURRENTS
S. F. Taylor, T. N. Claytor, D. G. Tuggle, and S. E. Jones 1994 12 p Presented at the 4th International Conference on Cold Fusion, Maui, HI, 6-9 Dec. 1993
(Contract W-7405-eng-36)
(DE94-009342; LA-UR-94-970; CONF-931263-1) Avail: CASI HC A03/MF A01

Tritium has been detected evolving from samples of deuteriated palladium wires and powders subject to pulsed high voltage at Los Alamos. They wanted to measure whether these samples were emitting neutrons. The idea of pulsing current through the wires and powders was to drive the deuterium in and out by rapid electrical heating. With promising tritium results in hand, the experiments were prepared at Los Alamos, and then taken to BYU and run in the neutron detector located in a tunnel in Provo canyon under 35 m of rock and dirt overburden. The neutrons detector and sample setup are described. Results including total neutron counts, time distributions, and an indication of the energy distributions are discussed. The results do not provide compelling evidence of neutron production, but are not inconsistent with earlier measurements of neutrons and tritium. Difficulties in explaining the difference in tritium and neutron measurements are also discussed. Plans for further work are presented. DOE

N94-33916# California Univ., Berkeley. Lawrence Berkeley Lab, CA.
USER'S GUIDE FOR ABCI VERSION 8.8, AZIMUTHAL BEAM CAVITY INTERACTION
Yong Ho Chin Feb. 1994 73 p
(Contract DE-AC03-76SF-00098)
(DE94-009638; LBL-35258; CERN-SL-94-02) Avail: CASI HC A04/MF A01

ABCI is a computer program which solves the Maxwell equations directly in the time domain when a bunched beam goes through an axisymmetric structure on or off axis. An arbitrary charge distribution can be defined by the user (default is Gaussian). This document is meant to be a comprehensive user's guide to describe all features of ABCI version 8.8, including also all additions since the release of the guide for version 6.2. The main advances lie in its higher speed of execution and improved capabilities of Fourier transformations. The impedance and the frequency spectrum of deposited energy can be calculated and plotted from the Fourier transforms of the wake potentials. The 'data windowing' technique can be applied to wake potentials in order to reduce the undesirable spectral leakage effect. A number of window functions can be chosen by the user. Numerical values of wake potentials as well as the Fourier transform results can be saved on separate files which can be used directly for other programs. In addition to these additions to the program, a criterion was derived for the numerical stability of the time iteration valid for the case where the longitudinal mesh size is larger than the radial one. If the time step is not fine enough to satisfy this criterion, a warning message will be issued and an appropriate value suggested. A second criterion was found to be required to guarantee the accuracy of the computed wake potentials for structures with long tapers. ABCI now also permits a structure with 'islands,' i.e. areas detached from the main body. An option was added to plot either electric field or total current lines at subsequent time steps for the monopole (m=0) case. ABCI is available as a source code in the CERN IBM VM/CMS system. DOE

N94-33924# California Univ., Santa Barbara, CA. Dept. of Electrical and Computer Engineering.
ELECTRON ACCELERATION BY LASER FIELDS IN A GAS
J. R. Fontana 31 Aug. 1993 20 p
(Contract DE-FG03-90ER-40545)
(DE94-008345; DOE/ER-40545/T6) Avail: CASI HC A03/MF A01

Both the 50-MeV electron accelerator and the short-pulse CO2 laser have become operational, and preliminary tests have already been performed involving electrons and shaped lasers beams inside a gas cell. Theoretical work has been performed on the topic of interaction region synthesis and on FEL-type devices involving a gas medium and no wiggler structures. Appendixes present some of the results. DOE

N94-33934# Japan Atomic Energy Research Inst., Tokyo (Japan).
MULTI-GROUP HELIUM AND HYDROGEN PRODUCTION CROSS SECTION LIBRARIES FOR FUSION NEUTRONICS DESIGN
Seiji Mori, S. Zimin, and Hideyuki Takatsu Sep. 1993 77 p
(DE94-727627; JAERI-M-93-175) Avail: CASI HC A05/MF A01

The helium and hydrogen production cross section libraries based on the JENDL-3 data file were compiled for use in neutronics and shielding design calculation of a fusion reactor. These libraries have the same group structures as the transport cross section sets, FUSION-J3 and FUSION-40, which are often used in fusion neutronics design and can be used as the response function libraries for the reaction rate calculation code, APPLE-3. These libraries were processed from the JENDL gas production cross section file which is one of the JENDL special purpose files. Some sample calculations using the discrete ordinate code, ANISN, with these libraries were performed and the results were compared with the existing results. Consequently it was found that the appropriate results can be obtained with these libraries. The generated multi-group cross sections for helium and hydrogen production are presented in graphs and tables. DOE

N94-33983# Brookhaven National Lab., Upton, NY.
H(-) INJECTION SIMULATION FOR A 5 MW SPALLATION NEUTRON SOURCE
L. N. Blumberg Feb. 1994 14 p Presented at the American Physical Society Conference, Washington, DC, 18-22 Apr. 1994
(Contract DE-AC02-76CH-00016)
(DE94-009003; BNL-60071; CONF-9404122-1) Avail: CASI HC A03/MF A01

BNL has conducted a study of a 'green field' pulsed spallation neutron source with a design objective of 5 MW of average proton beam power on a heavy element production target. The authors propose H(-) injection from a 600-MeV CCL linac into a pair of rapid (30 Hz) cycling synchrotrons with final energy 3.6-GeV and total output current of 1.394 mA. With a total throughput of 8.7 x 10(exp 15) p/s from the two 3.6-GeV rings, it is important that losses - particularly distributed loss around the rings - be minimized both for reasons of shielding requirements and activation of components. A reasonable limit for fractional distributed losses is less than or equal to 10(exp -3). A major source of such losses would be scattering of the incident H(-) beam and subsequent multiple traversals of the stripped protons out of the ring acceptance ellipses by multiple coulomb (MCS) and nuclear elastic scattering (NES). Indeed, Yamane, et al. have made an estimate of these losses for the Japanese Hadron Facility at 1-GeV incident H(-) energy through a 250 mu-g/cm(exp 2) C-12 stripper foil and obtain scattering losses of 5.4 x 10(exp -4). Such losses could be higher for the 600-MeV H(-) injection contemplated here. The authors, therefore, did a detailed Monte-Carlo simulation of muliturn injection through a carbon stripper foil to obtain quantitative loss estimates. The authors find that under optimal conditions with a rapidly (exponentially) collapsing

orbit bump of the ring horizontal (x) and vertical (z) acceptance ellipse through a 300 mu-g/cm(exp 2) 'postage stamp' (10 mm x 10 mm) C-12 foil and with 300 turn injection of an H(-) beam tracking the ellipse axis y' = -(alpha/beta)y, the scattering losses out of an A(sub x,z) = 400 pi mm-mrad acceptance ellipse with 50% filling is only 2.9 +/- 0.3 x 10(exp -5). DOE

N94-34077# Los Alamos National Lab., NM.
DEUTERON-INDUCED FUSION IN VARIOUS ENVIRONMENTS
G. M. Hale and T. L. Talley 1994 13 p Presented at the 4th International Conference on Cold Fusion, Maui, HI, 6-9 Dec. 1993
(Contract W-7405-eng-36)
(DE94-009305; LA-UR-94-722; CONF-931263-3) Avail: CASI HC A03/MF A01

The theory of deuteron-induced fusion will be discussed, first in free space, then in muonic molecules where the Coulomb repulsion is highly screened. It will be shown how a consistent description of the d + t reactions can be obtained in these environments using R-matrix theory. We compare fusion rates obtained from the time-dependent scattering theory with those implied by the partial widths of the resonance associated with muon-catalyzed d-t fusion. Finally, some speculative comments are made about how the d + d reactions might proceed in other media, such as metallic lattices. The unusual properties of states associated with 'shadow' poles might account for some of the strange results seen in cold fusion experiments. We emphasize that the same methods can, and should, be used to describe this situation as well as the other two well-established phenomena. DOE

N94-34381# Colorado Univ., Boulder, CO. Nuclear Physics Lab.
STUDIES IN INTERMEDIATE ENERGY NUCLEAR PHYSICS
R. J. Peterson 1 Oct. 1993 76 p
(Contract DE-FG02-86ER-40269)
(DE94-007602; DOE/ER-40269/15) Avail: CASI HC A05/MF A01

This report summarizes work carried out between 1 Oct. 1992 and 30 Sep. 1993 at the Nuclear Physics Laboratory of the University of Colorado, Boulder. The experimental program in intermediate-energy nuclear physics is very broadly based; it includes pion-nucleon and pion-nucleus studies at LAMPF and TRIUMF, kaon-nucleus scattering at the AGS, and equipment development for experiments at the next generation of accelerator facilities. DOE

74 OPTICS

Includes light phenomena; and optical devices.
For lasers see *36 Lasers and Masers.*

N94-33381# Molecular Technologies, Inc., Lowell, MA.
ORGANOSILICON POLYMERIC NONLINEAR OPTICAL MATERIALS FOR OPTICAL SWITCHING AND MODULATION Final Technical Report, 15 Jul. 1993 - 14 Jan. 1994
Sandip K. Sengupta, Lian Li, Jeng-I Chen, Sutiyao Marturunkakul, and Mario Cazeca 28 Feb. 1994 33 p
(Contract F49620-93-C-0039)
(AD-A278245; MIT-0039-03F; AFOSR-94-0243TR) Avail: CASI HC A03/MF A01

The objective of the project was to develop new polymeric materials for second-order nonlinear optical (NLO) applications, specifically electro-optic applications. Alkoxysiloxane derivatives of organic azo dye chromophores were synthesized and used to prepare NLO siloxanes by the sol-gel reaction with a siloxane polymer. The dipole moments and polarizabilities and hyperpolarizabilities of the chromophores were calculated by semi-empirical quantum mechanical modeling. A novel approach using interpenetrating polymer networks (IPN) combining a sol-gel based NLO siloxane with a thermally crosslinkable NLO azo dye attached epoxy network, as stable second-order NLO materials was also introduced. In two of these systems, the addition of another crosslinkable azo dye component to boost the NLO density was investigated. The materials were processed into thin films on substrates and simultaneously oriented by corona poling and thermally cured at temperatures up to 220 deg C. The NLO siloxanes showed relatively weak optical nonlinearities while the electro-optic coefficients of the IPN systems were reasonable large and temporal stability was excellent -- the materials showing considerable promise for practical applications. DTIC

N94-33411# North Carolina Univ., Greensboro, NC. Dept. of Biology.
COMPARISON OF NUMERICAL MODELS FOR COMPUTING UNDERWATER LIGHT FIELDS Annual Report
Robert H. Stavn Apr. 1994 24 p
(Contract N00014-89-J-3137)
(AD-A278256) Avail: CASI HC A03/MF A01

This report documents the efforts of nearly all of the active optical modelers in the world to establish a standard set of optical input parameters and of radiant flux outputs to be expected in a hydrosol that exhibits these optical parameters. I contributed output from the NRL optical model (Monte Carlo) for comparisons of output for molecular water, a standard hydrosol scattering function, and the contribution of water Raman scattering. Optical energy trapping near the water/air interface was verified. In addition, the effects of a simple model of skylight radiance and marine aerosols were investigated. The results of the simple skylight model were in accord with the results of the more complex layered models of the atmosphere. The long term goal of this study and collaboration is to establish a standard optical model of the ocean. DTIC

N94-33548 Army Aeromedical Research Lab., Fort Rucker, AL.
FORWARD-LOOKING INFRARED: CAPABILITIES FOR SEARCH AND RESCUE
Jeff Rabin Feb. 1994 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DA Proj. 3M1-62787-A-879)
(AD-A277895; USAARL-94-11) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Joint doctrine for search and rescue stress capability and flexibility to respond to various mission scenarios. Expanded mission requirements will necessitate enhanced visual capabilities for navigation and rescue in hostile environments. Forward-looking infrared (FLIR) is to be used for search, rescue, and navigation on the U.S. Army MEDEVAC (UH-60Q) helicopter currently under development. The purpose of this study was to determine FLIR capabilities needed for search and rescue operations with the UH-60Q (concept) helicopter. Five aviators were assessed in flight with two FLIR systems having different magnification and look-down capabilities. Detection and recognition of a human target and aircraft positioning for rescue were evaluated using FLIR. There was no difference between FLIR systems in the distance for detection of the human target (p greater than 0.50), but recognition occurred at a four times greater range with sensor magnification (p less than 0.01). In addition, the accuracy of aircraft positioning for rescue was two times greater with unrestricted look-down capability in the FLIR system (p less than 0.03). These results indicate the value of multiple FLIR magnification and complete look-down capability for search and rescue operations. DTIC

N94-33591 Texas Instruments, Inc., Dallas. Central Research Labs.
PHASE-ONLY 128X128 SPATIAL LIGHT MODULATOR BASED ON LASLM TECHNOLOGY Final Report, 1 Oct. 1990 - 31 Oct. 1993
Jerry Leonard Dec. 1993 21 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F19628-90-C-0134)
(AD-A277901; RL-TR-93-240) Avail: CASI HC A03

This contract was for the purpose of building 128x128 pixel spatial light modulator capable of phase-only modulation using TI's unique flexure beam deformable mirror device (DMD) technology. The flexure beam DMD contains mirror elements that move vertically in response to an electrostatic force. The resulting piston-like motion provides broad range analog phase modulation with minimal amplitude modulation. Problems in the CCD addressing prevented the completion and delivery of a fully functioning device. DTIC

N94-33670# Florida Univ., Gainesville, FL.
MULTIFUNCTIONAL GEL-SILICA OPTICS Final Report, 1 Mar. 1990 - 31 Dec. 1993
Larry L. Hench 31 Jan. 1994 77 p
(Grant AF-AFOSR-0193-91)
(AD-A278531; AFOSR-94-0157TR) Avail: CASI HC A05/MF A01

High purity gel-silica matrices are produced using alkoxide sol-gel processing to form net-shape optical components with interconnected porosity. The porous optical matrices are impregnated with optically active polymers to produce multifunctional optical composites such as tunable dye lasers, scintillators, and photopolymerized 3-D gratings. Thus, the feasibility has been established for a new generation of multi-functional optical materials for sensors, detectors, waveguides, transpiration cooling, lasers, scintillators, multiplexers, etc. DTIC

N94-33672 Stanford Univ., CA.
NEW LIGHT SOURCES AND CONCEPTS FOR ELECTRO-OPTIC SAMPLING Final Technical Report, 1 Jan. 1992 - 31 Dec. 1993
David M. Bloom Mar. 1994 101 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0099)
(AD-A278533; AFOSR-94-0236TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Research to improve electro-optic sampling led to the development of several high performance optical phase modulators. These phase modulators serve as a 'time-lens' in a series of experiments on temporal optical systems. These systems are used to generate, manipulate and measure optical pulses. Significant results have been shown in three areas. First is active optical pulse compression, where 55 ps 1.064 micron pulses were compressed to 1.7 ps. Notably, laser timing jitter is reduced in this process. Second, temporal imaging demonstrated the ability to magnify the time axis of an optical pulse, stretching a short pulse into a longer replica. This tool has application in pulse shape measurement and optical signal processing. Finally, a new method of optical pulse shape measurement was demonstrated with 3 ps time resolution, excellent power sensitivity and relative system simplicity. These experiments have opened up the field of temporal optics. DTIC

N94-33698 Department of the Navy, Washington, DC.
SPECTRALLY-SELECTIVE FIBER TRANSMISSION FILTER SYSTEM Patent Application
Alan D. Kersey, inventor (to Navy) 19 Nov. 1993 27 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-D016133; US-Patent-Appl-SN-154419; Navy-Case-74821) Avail: CASI HC A03

An in-line, spectrally-selective fiber Fabry-Perot transmission filter includes an optical fiber piece having a broad-band mirror and a narrow-band Bragg grating element formed therein, the mirror and the grating forming a Fabry-Perot resonant cavity therebetween. The filter may be used to form part of a fiber ring laser configuration. The combination of the broad-band mirror and the narrow-band Bragg grating element in an optical fiber piece can also be formed into a spectrally-selective fiber Michelson filter. DTIC

N94-33720* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ROTATING UNBALANCED MASS PROOF-OF-CONCEPT (Videotape)
1993 Videotape: 7 min. playing time, in color, with sound
(NASA-TM-109814; NONP-VT-94-12942) Avail: CASI VHS A01/BETA A22

The video describes the Rotating Unbalanced Mass. The Rotating Unbalanced Mass is a device for scanning ground-based, balloon-borne, and space-based gimbaled payloads, as well as free-flying spacecraft. This device offers advantages over other methods of scanning--especially large payload scanning at high frequencies--such as reduced system power and mass, improved system stability and reliability, and better scan accuracy. CASI

N94-33739 Texas A&M Univ., College Station, TX. Dept. of Electrical Engineering.
SPECTRAL-DOMAIN OPTICAL PROCESSING TECHNIQUES Annual Report, 30 Sep. 1991 - 31 Mar. 1993
Henry F. Taylor 20 Apr. 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0417-91)
(AD-A278371; AFOSR-94-0203TR) Avail: CASI HC A03

Optical techniques for spectral domain processing (SDP) have been investigated. A computer model for the design of nonlinear devices for frequency mixing in multiquantum well (MQW) materials has been developed. The model has been used to calculate nonlinear coefficients for mixing of pump lasers at wavelengths near 1.3 micron and 1.55 micron to produce an output near 8.05 micron. A device length for conversion of 0.6 mm is predicted for a pump power density of 10(exp 6) W/sq cm. A quasi-phase-matching scheme for obtaining high conversion efficiency in a dispersive semiconductor material has been devised. An N-dimensional hypercube network configuration making use of the frequency conversion devices has been proposed. The scheme allows for all-optical transmission of data from source node to destination node without optical-to-electrical conversion. DTIC

N94-33760 Department of the Navy, Washington, DC.
METHOD AND DEVICE FOR IMPROVED IR DETECTION WITH COMPENSATIONS FOR INDIVIDUAL DETECTOR RESPONSE Patent
Kenneth C. Hepfer, inventor (to Navy), S. R. Horman, inventor (to Navy), and Bob Horsch, inventor (to Navy) 4 Jan. 1994 8 p Filed 21 Apr. 1992
(AD-D016153; US-Patent-5,276,319; US-Patent-Appl-SN-871779; US-Patent-Class-250-208.1) Avail: US Patent and Trademark Office

An advanced infrared (IR) sensor based on the present invention would add the following two elements to a basic staring IR sensor using a 2 dimensional array of detector elements to significantly enhance the detection sensitivity of the device. The added features are: (1) Additional optics or modification to the normal optics to scan the image over a small fraction of the array dimensions so that each point in the image is sampled by a number of different detector elements, and (2) signal processing to combine the multiple samples for each image point so as to exclude the effects of 'dead', 'weak' or excessively noisy detector elements and average out the element to element sensitivity variations and calibration/correction imperfections of the 'normal' elements. DTIC

N94-33761 Department of the Navy, Washington, DC.
FIBER OPTIC MICROCABLE PRODUCED WITH RADIATION CURED COMPOSITE Patent
Steven J. Cowen, inventor (to Navy) and Christopher M. Young, inventor (to Navy) 2 Nov. 1993 9 p Filed 23 May 1988
(AD-D016155; US-Patent-5,259,055; US-Patent-Appl-SN-197491; US-Patent-Class-385-100) Avail: US Patent and Trademark Office

The invention provides a fiber optic microcable having a uniform cross sectional dimension which may be manufactured in continuous lengths that exceed 10 kilometers. The microcable is comprised of an optical fiber core, a buffer surrounding the core, and a protective sheath surrounding the buffer consisting of an electromagnetic radiation cured resin impregnated with fibers suspended in the resin to enhance the resistance of the microcable to physical damage. The microcable is fabricated by soaking the fibers in an electromagnetic radiation curable resin, placing the wetted fibers around the core and buffer to form a matrix, and then irradiating the matrix with electromagnetic radiation to cure the resin. DTIC

N94-33764 Department of the Navy, Washington, DC.
FIBER-OPTICAL TESTING SYSTEM HAVING A DETECTION CIRCUIT Patent
Francis L. Needham, inventor (to Navy) 18 Jan. 1994 9 p Filed 26 May 1992
(AD-D016159; US-Patent-5,280,335; US-Patent-Appl-SN-888074; US-Patent-Class-356-73.1) Avail: US Patent and Trademark Office

A system for testing a fiber-optic component with infrared radiation is provided. The testing system has a source of infrared radiation, an optic coupler, a detecting circuit, and an analog tape recorder. The optic coupler directs the infrared radiation onto the fiber-optic component. The detection circuit is electrically connected to the tape recorder. The detection circuit has an amplifier, a potentiometer connected in parallel to the amplifier, and a photoelectric transducer connected in series to the amplifier. These components are mounted on a non-conductive board. A power source supplies voltage and is connected to the amplifier. The circuit operates by having the photoelectric transducer sense the infrared radiation emitted from the tested fiber-optic component and convert the radiation into an electrical signal. The amplifier then amplifies the electrical signal to the voltage necessary for driving the tape recorder. DTIC

N94-33862# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
INFRARED TROUBLES OF DIFFERENTIAL RENORMALIZATION
L. V. Avdeev, D. I. Kazakov, and I. N. Kondrashuk 1992 24 p
(DE94-611119; JINR-E-2-92-538) Avail: CASI HC A03/MF A01 (US Sales Only)

The possibility of generalizing differential renormalization of D.Z. Freedman, K. Jonnson and J.I. Latorre in an invariant fashion to theories with infrared divergencies is investigated. It is concluded that the calculations on infrared differential renormalization lead to incorrect results. DOE

N94-33903 Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
IVES-STILWELL EXPERIMENT AND RELATIVISTIC LENGTH
V. N. Streltsov 1992 10 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE94-611076; JINR-D-2-92-552) Avail: CASI HC A02 (US Sales Only)

The radar formulation of the relativistic theory operates with light or retarded distances and relativistic or radar length introduced on their basis. In spite of this the aberration of light should be considered as the first manifestation of the light distance. DOE

N94-33911# Lawrence Livermore National Lab., CA.
PERFORMANCE OF ADAPTIVE OPTICS AT LICK OBSERVATORY
S. S. Olivier, J. An, and K. Avicola Mar. 1994 15 p Presented at the Society of Photo-Optical Instrumentation Engineers Conference, Kona Beach, HI, 13-18 Mar. 1994
(Contract W-7405-eng-48)
(DE94-009382; UCRL-JC-116506; CONF-940391-2) Avail: CASI HC A03/MF A01

A prototype adaptive optics system has been developed at Lawrence Livermore National Laboratory (LLNL) for use at Lick Observatory. This system is based on an ITEX 69-actuator continuous-surface deformable mirror, a Kodak fast-framing intensified CCD camera, and a Mercury VME board containing four Intel i860 processors. The system has been tested using natural reference stars on the 40-inch Nickel telescope at Lick Observatory yielding up to a factor of 10 increase in image peak intensity and a factor of 6 reduction in image full width at half maximum (FWHM). These results are consistent with theoretical expectations. In order to improve performance, the intensified CCD camera will be replaced by a high-quantum-efficiency low-noise fast CCD camera built for LLNL by Adaptive Optics Associates using a chip developed by Lincoln Laboratory, and the 69-actuator deformable mirror will be replaced by a 127-actuator deformable mirror developed at LLNL. With these upgrades, the system should perform well in median seeing conditions on the 120-inch Shane telescope for observing wavelengths longer than approximately 1 micron and using natural reference stars brighter than m(sub R) approximately 10 or using the laser currently being developed at LLNL for use at Lick Observatory to generate a sodium-layer reference star. DOE

N94-33925# Sandia National Labs., Albuquerque, NM.
ILLUMINATORS FOR EXTREME ULTRAVIOLET LITHOGRAPHY CAMERAS WITH RING FIELDS
W. C. Sweatt 1994 6 p Presented at the Optical Society of America Meeting on Diffractive Optics: Design, Fabrication and Applications, Rochester, NY, 6-8 Jun. 1994
(Contract DE-AC04-94AL-85000)
(DE94-008423; SAND-94-0236C; CONF-9406116-3) Avail: CASI HC A02/MF A01

Scanning, ring-field lithographic cameras designed for 14-nm radiation can print 100-nm features on large chips. Mating high-efficiency illuminators are described. DOE

N94-33982# Brookhaven National Lab., Upton, NY.
CONCEPTS FOR UV-FEL OPTICS
E. D. Johnson Nov. 1993 13 p
(Contract DE-AC02-76CH-00016)
(DE94-008996; BNL-49776) Avail: CASI HC A03/MF A01

Brookhaven National Laboratory has developed a design for an ultraviolet free electron laser facility utilizing a seeded amplifier approach. Since the accelerator is a single pass device, resonator and outcoupler mirrors which are a difficult aspect of oscillator FEL designs are not required. The result is a source of high peak power VUV radiation with the mode structure, bandwidth, and frequency stability of the input seed laser. The accelerator provides pulses of radiation at up to 10 kHz, so to maximize the utilization of the source, novel optical systems to share the radiation had to be developed. These include specialized alignment, beam transport, order sorting, and multiplexing optics. In addition, FEL on FEL pump-probe experiments are made possible by a variable optical delay of up to 10 ns operating in the wavelength range of 200 to 75 nm. Some aspects of the FEL design are also described to clarify the constraints and choices for the optical system. DOE

N94-34002# Arizona State Univ., Tempe, AZ. Dept. of Industrial and Management Systems Engineering.
STUDIES OF THE EFFECT OF IMAGE DEGRADATION AND RECOMBINATION Annual Report No. 2, 1 Mar. 1993 - 1 Mar. 1994
William R. Uttal 15 Mar. 1994 7 p
(Contract F49620-92-J-0176)
(AD-A278343; PERLab-3; AFOSR-94-0221TR) Avail: CASI HC A02/MF A01

The second year of this grant has been very productive. We completed the major study that was underway last year and have moved on to complete two other major programmatic studies. The ongoing study that is now complete was the one in which we explored the effects of noise, Fourier filtering, reduced acuity (by means of blocking) and combinations thereof in a discrimination task. Ten experiments were carried out in this series. A publication on this work has been submitted for publication and is now being reviewed. From there we went on to consider the combination of degradations by the visual system rather than by means of the computer. In this study degraded images were combined with dichoptic viewing. A manuscript describing this work has also been submitted and is under review. We then undertook to study the effect of combinations of degradations on a recognition task. That work has also been completed and is in the process of being analyzed. The first paper submitted from our laboratory on the psychophysical foundations of night vision devices has been accepted for publication. DTIC

N94-34006# Quantex Corp., Rockville, MD.
HARDWARE IMPLEMENTATION OF TIME LENSES AND ULTRAFAST OPTICAL TEMPORAL PROCESSORS, PHASE 1 Final Report, 1 Sep. 1993 - 28 Feb. 1994
Xiang-Yang Yang 31 Mar. 1994 33 p
(Contract F49620-93-C-0062)
(AD-A278352; AFOSR-94-0235TR-Phase-1) Avail: CASI HC A03/MF A01

The concept of time lens is based on the analogy between optical spatial diffraction and temporal dispersion. It extends our knowledge of optics in the space-domain into the time domain. Novel temporal imaging and signal processing systems can be created that mimic the operation of their spatial counterparts in the space-domain. A distinctive advantage of these temporal processing systems is their extremely high speed, up to picosecond range with currently available devices. In this Phase 1 program, we have studied the space-time duality and established a theoretical model for general temporal imaging systems. Design criteria for a phase chirp modulator as well as dispersive delay lines have been developed. Several temporal imaging and signal processing systems have been designed with commercially available optical and optoelectronic devices. Various applications of these temporal processing systems were studied. A temporal microscope and a temporal 4-f filtering system have been identified for prototype development in Phase 2. DTIC

N94-34094 National Defence Research Establishment, Stockholm (Sweden). Dept. of Information Technology.
FOA 33 [INSTITUTIONEN FOER OPTISK TEKNIK]
Nov. 1993 30 p In SWEDISH
(PB94-149184; FOA-C-30737-3.1) Avail: Issuing Activity (National Technical Information Service (NTIS))

This report gives a brief summary of the activities at the Division of Optical Technology at FOA 3 during the fiscal year 1992/93. NTIS

N94-34095 National Defence Research Establishment, Stockholm (Sweden). Dept. of Information Technology.
HIDDEN SURFACE REMOVAL IN A COMPUTER MODEL FOR GENERATION OF INFRARED IMAGES [BORTTAGNING AV SKYMDA YTOR I DATORMODELL FOER GENERERING AV IR-BILDER]
C. Hedberg Nov. 1993 65 p In SWEDISH
(PB94-149192; FOA-C-30735-8.3) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report describes an algorithm for sorting triangles and removing hidden surfaces in a computer model for generation of infrared images. The algorithm is an advanced depth-sorting algorithm with a novel method to decide which of two triangles is closer to the observer. The novel function in the program removes the partly hidden triangle and creates new triangles which correspond to the parts of the original triangle that were not hidden. Surfaces can be transparent and the transparency is used when temperature and radiance is calculated. The algorithms that are described in this report have been implemented and added to an existing program. NTIS

N94-34127 National Defence Research Establishment, Linkoeping (Sweden). Huvudavdelning foer informationsteknologi.
SMART IR-CAMERA: DESCRIPTION OF A SIMULATOR [SMART IR-KAMERA: BESKRIVNING AV EN SIMULATOR]
T. Gustafsson, G. Carlsson, and U. Ringh Dec. 1993 33 p In SWEDISH
(PB94-149010; FOA-C-30741-3.1) Avail: Issuing Activity (National Technical Information Service (NTIS))

A Silicon based smart camera designed for the visual part of the optical spectrum can be used to simulate the corresponding functions of a smart IR camera. We describe how such a simulator is built up. The aim is to investigate how a future smart IR camera could be used to improve the function of IR systems used for surveillance and reconnaissance. The arguments for the use of a smart camera are discussed. The smart camera MAPP2200 is also described. The simulator and its performance is discussed in detail. The basic idea of the simulator is to project the IR image on a small liquid crystal display. This display will be the input image for the smart camera MAPP2200. All the processing functions in MAPP2200 can be fully used to work on the IR images in real time. NTIS

N94-34151 Department of the Navy, Washington, DC.
METHOD PROVIDING OPTIMUM OPTICAL TRAINS ALIGNMENT IN A PASSIVE MULTI-CHANNEL FIBER OPTIC ROTARY JOINT Patent
Gregory H. Ames, inventor (to Navy) 14 Dec. 1993 13 p Filed 5 Oct. 1992
(AD-D016125; US-Patent-5,271,076; US-Patent-Appl-SN-956326; US-Patent-Class-385-26) Avail: US Patent and Trademark Office

A method is disclosed for use in the fabrication of a passive multichannel optical fiber rotary joint having an axis of rotation and of the type in which optical fiber communication channels are coupled via bilaterally symmetrically disposed miniature collimation lenses as collimated beams to one and the other sides of an image derotation prism and prism rotational drive assembly prism which rotates at a predetermined ratio of the relative rotation of the sides of the rotary joint to derotate optical propagation paths across the transverse rotary interface associated with the respective ones of the miniature collimation lenses. Each channel at each side of the rotary joint includes a fiber and lens junction at which a ferrule encased fiber termination couples to the axially outwardly disposed face of the miniature collimation lens. A lens array holding piece serves as the mount for this junction. Each array piece is provided with a locality of axial engagement at the adjacent side of the image derotation prism of the image derotation prism and prism rotational drive subassembly. DTIC

N94-34913# National Oceanic and Atmospheric Administration, Washington, DC. Satellite Applications Lab.
DETECTION AND ANALYSIS OF FOG AT NIGHT USING GOES MULTISPECTRAL INFRARED IMAGERY
Gary P. Ellrod Jan. 1994 27 p
(NOAA-TR-NESDIS-75) Avail: CASI HC A03/MF A01

The detection and short range forecasting of fog and low stratus clouds at night pose a difficult problem for aviation or marine meteorologists. The number of surface observing sites over land is insufficient to determine the true extent of fog, since many of these stations reduce operations at night. Weather reports from ocean going vessels are usually made at six hourly intervals and are concentrated on major shipping lanes. Because of the low density of these surface observations, especially at night, remote sensing techniques must be used to determine the coverage of fog and low clouds. When fog is observed at an airfield, it is important to know its horizontal extent in order to estimate the time when it will dissipate. Using daylight visible imagery, Gurka observed that fog usually dissipates from the outer edges inward. Clearing will thus occur sooner if the station is close to the upwind edge of the fog bank. Information on fog thickness is another important parameter that can be used to estimate dissipation time. The thicker the fog is, the longer the time required for clearing. Thus, knowledge of the location, movement, and thickness of fog and stratus clouds during the predawn hours is critical for short range forecasts. Infrared (IR) imagery from weather satellites such as the Geostationary Operational Environmental Satellite (GOES) operated by the United States is the primary tool for fog detection at night due to its relatively high frequency (30 min). The spatial resolution of the IR window channel, although limited to 8 km, is sufficient for fog detection. The greatest difficulty in the use of a single IR window channel is that the thermal contrast between fog and surrounding clear regions is often insufficient for proper detection, even with the use of image enhancement and animation techniques. This paper describes a technique that uses two GOES IR window channels at different wavelengths to identify regions of fog or stratiform clouds at night regardless of existing surface temperatures. A method of estimating cloud thickness from this data will also be described. Examples of the effectiveness of this technique will be shown for cases of fog over: flat terrain, large bodies of water, and mountainous, snow-covered regions. Derived from text

N94-34914*# State Univ. of New York, Stony Brook, NY. Dept. of Electrical Engineering.
FIBER OPTIC PROBES FOR LASER LIGHT SCATTERING: GROUND BASED EVALUATION FOR MICGROGRAVITY FLIGHT EXPERIMENTATION. INTEGRATED COHERENT IMAGING FIBER OPTIC SYSTEMS FOR LASER LIGHT SCATTERING AND OTHER APPLICATIONS Final Report
Harbans Singh Dhadwal 1 Jun. 1994 76 p
(Contract NCC3-241; SUNYRF-4314404A)
(NASA-CR-194377; NAS 1.26:194377) Avail: CASI HC A05/MF A01

The research work presented in this report has established a new class of backscatter fiber optics probes for remote dynamic light scattering capability over a range of scattering angles from 94 degrees to 175 degrees. The fiber optic probes provide remote access to scattering systems, and can be utilized in either a noninvasive or invasive configuration. The fiber optics create an interference free data channel to inaccessible and harsh environments. Results from several studies of concentrated suspension, microemulsions, and protein systems are presented. The second part of the report describes the development of a new technology of wavefront processing within the optical fiber, that is, integrated fiber optics. Results have been very encouraging and the technology promises to have significant impact on the development of fiber optic sensors in a variety of fields ranging from environmental monitoring to optical recording, from biomedical sensing to photolithography. Author (revised)

N94-34923*# Toledo Univ., OH. Dept. of Chemical Engineering.
PARTIAL SPREADING OF A LASER BEAM INTO A LIGHT SHEET BY SHOCK WAVES AND ITS USE AS A SHOCK DETECTION TECHNIQUE Final Report
J. Panda May 1994 19 p
(Grant NAG3-1338; RTOP 505-62-52)
(NASA-CR-195329; E-8809; NAS 1.26:195329) Avail: CASI HC A03/MF A01

It is observed that when a laser beam is allowed to fall on a shock surface at a grazing incidence, a small part of the beam spreads out in a thin, diverging sheet of light normal to the surface, and both upstream and downstream of the shock. The phenomenon is visualized by observing a cross section of the light sheet on a screen placed normal to the laser path after it touches a shock. The light sheet disappears when the beam is moved to any other locations where there is no shock or the beam pierces the shock surface, i.e., at a non-grazing incidence. The spread angle of the light sheet is considerably higher than the angle by which the beam may bend as it passes through the shock, which produces a small difference of refractive index. Various details indicate that the spread light

is a result of diffraction of a small part of the laser beam by the shock whose thickness is nearly the same as that of the laser wavelength. Shocks formed in underexpanded free jets of fully expanded Mach numbers 1.4 to 1.8 are used for this experiment. The above optical phenomenon is used as the basis of a novel shock detection technique which depends on sensing the spread light using a photomultiplier tube (PMT). The locations of the shock surfaces in the underexpanded supersonic jet, obtained using this technique, match with those inferred from the Schlieren photographs and velocity measurements. Moreover, if the shock oscillates, a periodic PMT signal is obtained which provides information about the frequency and amplitude of shock motion. Author

N94-33648*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TECHNICAL PARAMETERS FOR SPECIFYING IMAGERY REQUIREMENTS Abstract Only
Paul P. Coan and Sheri J. Dunnette *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 557 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N94-33555 Cornell Univ., Ithaca, NY. Lab. of Plasma Studies.
PLASMA PHYSICS APPLICATIONS TO INTENSE RADIATION SOURCES, PULSED POWER AND SPACE PHYSICS. SHORT PULSE ULTRA INTENSE LASER-PLASMA INTERACTION EXPERIMENT Final Report, 1 Jan. 1990 - 31 May 1993
R. N. Sudan 31 May 1993 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-90-J-2002)
(AD-A278440) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Intense bright x-ray sources from dense z-pinch and x-pinch plasmas are being investigated for photo-pumping x-ray laser media. Crossed aluminum wire x-pinches with mass line density up to hundreds of micrograms per centimeter have been imploded by up to 600 kA current for 40 ns using a 0.5 TW pulsed power generator. High density bright spots are observed. Soft x-ray spectroscopy was used to infer plasma density of up to approximately 10 to the 20th power per cubic cm and temperature of 100-300 eV. The optimum mass loading for different ionization stages of aluminum ions was examined. Parallel wire z-pinches yielded both lower density up to approximately 10(exp 19)/cc and lower temperatures (70-200 eV), than the x-pinch plasmas. DTIC

N94-33879# California Univ., Davis, CA.
BEAT WAVE CURRENT DRIVE EXPERIMENT ON THE DAVIS DIVERTED TOKAMAK (DDT)
D. Q. Hwang, R. D. Horton, and J. H. Rogers 1993 10 p
(Contract DE-FG03-89ER-53289)
(DE94-009770; DOE/ER-53289/T2) Avail: CASI HC A02/MF A01

The beatwave current drive experiment is summarized. The first phase of the experiment was the construction of the microwave sources and the diagnostics needed to demonstrate the beat wave effects, i.e. the measurement of the electrostatic plasma wave produced by the beating of two high intensity electromagnetic waves. In order to keep the cost of the experiments to a minimum, a low density filament plasma source (10(exp 8)) to 10(exp 10) particles cm(exp -3)) was employed and the magnetic field in the toroidal plasma was produced by a dc power supply. DOE

N94-33913# Texas Univ., Austin, TX. Inst. for Fusion Studies.
DYNAMICAL NATURE OF INVISCID POWER LAW FOR TWO-DIMENSIONAL TURBULENCES AND SELF-CONSISTENT SPECTRUM AND TRANSPORT OF PLASMA FILAMENTS
Y. Z. Zhang (International Centre for Theoretical Physics, Trieste, Italy.) and S. M. Mahajan Feb. 1994 14 p
(Contract DE-FG05-80ET-53088)
(DE94-009425; DOE/ET-53088/647; IFSR-647) Avail: CASI HC A03/MF A01

On the basis of equal-time correlation theory (a nonperturbative approach) inviscid power laws of two dimensional isotropic plasma turbulences with one Lagrangian inviscid constant of motion are unambiguously solved by determining the dynamical characteristics. Two distinct types of induced transport, according to the divergence of the inverse correlation length in the inviscid limit, are revealed. This analysis also suggests a physically reasonable closure. The self-consistent system (a set of integral equations) for plasma filaments is investigated in detail, and is found to be a nonlinear differential eigenvalue problem for the diffusion coefficient D, with the Dyson-like integral equation playing the role of a boundary condition. This new type of transport is non-Bohm-like, and shows quasilinear behavior even in the strong turbulence regime. Physically, this behavior arises from a synchronization of the shrinking squared correlation length with the decorrelation time, for which the 'mixing-length' breaks down. The shrinkage of correlation length is a characteristic pertaining to the new type of turbulence; its relationship with the turbulence observed in supershot regime on TFTR is commented on. DOE

N94-33920# Grumman Aerospace Corp., Princeton, NJ.
HIGH BETA AND SECOND STABILITY REGION TRANSPORT AND STABILITY ANALYSIS
M. H. Hughes, M. W. Phillps, and A. M. M. Tood Dec. 1993 48 p
(Contract DE-FG02-89ER-51124)
(DE94-009654; DOE/ER-51124/14) Avail: CASI HC A03/MF A01

This report describes both ideal and resistive MHD stability studies of supershot plasmas in TFTR. The MHD equilibrium and stability modeling of TFTR plasmas has concentrated on those experiments where the safety factor, q, profile was inferred from motional Stark effect measurements (MSE). These are conveniently divided into two groups, first where q is less than unity over some fraction of the plasma radius and, secondly, where q everywhere exceed unity. In the first case, the experimental result that q is less than I together with the very large pressure gradients predicted by TRANSP analysis pose a major challenge to the validity of ideal MHD theory since these plasmas are usually observed to be free of any coherent 1/1 instability. In the second case where q is greater than I we revisit the resistive stability properties of low beta, high q(sub edge) supershots again using MSE q-profiles as a starting point. We find that 2/1 and 3/2 tearing modes can be excited in some circumstances and that the MSE profiles are typically near marginal stability to each of these modes. DOE

N94-33990# Rochester Univ., NY. Lab. for Laser Energetics.
LLE REVIEW, VOLUME 57
A. Simon, ed. 1993 64 p
(Contract DE-FC03-92SF-19460)
(DE94-009186; DOE/SF-19460/02-Vol-57) Avail: CASI HC A04/MF A01

During this quarter, the visible fruits of long design labors on the OMEGA upgrade began to appear. The target mirror structure was put in place, along with the target chamber itself. The laser bay structures were also installed, and the bay is now being prepared to receive optomechanical, control, and laser assemblies. Further details are in the OMEGA Upgrade Status Report in this issue. Theory and analysis of previous experiments continued during this reporting period. Articles contained herein describe an improved theory of the ablative Rayleigh-Taylor instability; a novel proposal for characterizing plasma density profiles by using grid image refractometry; a much-improved treatment of the damping of ion sound waves in a mixture of light and heavy ions; and, finally, a new interpretation of measurements of 3/2-harmonic radiation emitted from the long-scale-length plasmas created in earlier OMEGA experiments. DOE

N94-34012# General Atomic Co., San Diego, CA.
SUMMARY OF EXPERIMENTAL PROGRESS AND SUGGESTIONS FOR FUTURE WORK
K. H. Burrell Mar. 1994 16 p Presented at the IAEA Meeting on H-Mode Physics, Naka, Japan, 15-17 Nov. 1993
(Contract DE-AC03-89ER-51114)
(DE94-008893; GA-A-21587; CONF-9311147-7) Avail: CASI HC A03/MF A01

Since the last H-mode workshop in 1991, there has been significant progress in a number of areas. In addition to H-modes in tokamaks, H-mode has been achieved in a current-free stellarator, a heliotron/torsatron with some net toroidal current and in a linear, tandem mirror. Because H-mode has been seen in a variety of magnetic confinement devices and has been produced by a variety of methods, a universal explanation is needed for the H-mode confinement improvement. The hypothesis of turbulence stabilization by sheared E x B flow has this universality. New diagnostics have confirmed the structure of E(sub r) at the plasma edge in tokamaks and have lead to direct determination of the reduction in turbulence-driven transport in the H-mode. Improved measurements of the edge rotation and pressure gradients in tokamaks have lead to better understanding of the physics of the E(sub r) formation and to tighter tests of L to H transition theories. Significant improvements in core confinement have also been seen in several tokamaks; the data here indicate that sheared E x B flow may be playing a role in the core confinement improvement. Power balance studies of the change in core thermal diffusivity after the L to H transition have raised fundamental questions about the relationship between heat flux and the temperature gradient. Finally, helium transport studies have show that helium transport is quite similar to deuterium transport, indicating that helium ash removal in a reactor operating in ELMing H-mode should be feasible. DOE

N94-34140# Wisconsin Univ., Madison, WI.
TRANSPORT PROPERTIES OF INTERACTING MAGNETIC ISLANDS IN TOKAMAK PLASMAS
T. A. Gianakon, J. D. Callen, and C. C. Hegna Oct. 1993 50 p
(Contract DE-FG02-86ER-53218)
(DE94-009208; UW-CPTC-93-7) Avail: CASI HC A03/MF A01

This paper explores the equilibrium and transient transport properties of a mixed magnetic topology model for tokamak equilibria. The magnetic topology is composed of a discrete set of mostly non-overlapping magnetic islands centered on the low-order rational surfaces. Transport across the island regions is fast due to parallel transport along the stochastic magnetic field lines about the separatrix of each island. Transport between island regions is assumed to be slow due to a low residual cross-field transport. In equilibrium, such a model leads to: a nonlinear dependence of the heat flux on the pressure gradient; a power balance diffusion coefficient which increases from core to edge; and profile resiliency. Transiently, such a model also exhibits a heat pulse diffusion coefficient larger than the power balance diffusion coefficient. DOE

N94-34221# Wisconsin Univ., Madison, WI.
MAGNETIC ISLAND EFFECTS, INTERACTIONS IN TOKAMAKS
J. D. Callen, Z. Chang, R. L. Coffey, T. A. Gianakon, C. C. Hegna, A. I. Smolyakov, W. X. Qu, and J. P. Wang Oct. 1993 9 p Presented at the Workshop on Local Transport Studies in Fusion Plasmas, Varenna, Italy, 30 Aug. - 3 Sep. 1993
(Contracts DE-FG02-86ER-53218; DE-FG02-92ER-54139)
(DE94-009209; UW-CPTC-93-8; CONF-9308183-4) Avail: CASI HC A02/MF A01

This paper explores a number of aspects of isolated and interacting magnetic islands, and their effects, in tokamak plasmas. The temperature fluctuations induced by an isolated magnetic island in a rotating tokamak plasma are shown to be surprisingly small: T(sub rms) approximately less than 0.1 w absolute value of dT(sub 0)/dr in which w is the island width. Pressure gradient driven neoclassical MHD magnetic islands are posted as the cause of the isolated low m/n islands sometimes observed in high performance tokamak plasmas. They also form the basis for a recently advanced interacting-island model for the tokamak magnetic 'equilibrium' in which mostly nonoverlapping islands, across which transport is rapid, are separated by 'good' flux surface regions. In combination these bad, good transport regions produce 'stair-step' temperature and pressure profiles. Finally, an interacting-island transport model is developed and shown to exhibit many of the transient transport properties observed in tokamak plasmas: nonlinear response of temperature gradient to increased heating, pulse propagation faster than equilibrium, and fairly strong 'profile resiliency.' DOE

N94-35079# Lawrence Livermore National Lab., CA.
ICF PROGRAM Annual Report, 1988 - 1989
Sep. 1993 655 p
(Contract W-7405-eng-48)
(DE94-008281; UCRL-LR-105820-88/89) Avail: CASI HC A99/MF A06

This report contains discussions on the following topics: Target Physics; Nova Experiments; Nova Laser Science and Technology; Target Science and Technology; Advanced Drivers; and ICF Applications. DOE

N94-35080# Lawrence Livermore National Lab., CA.
A REVIEW OF THE ABLATIVE STABILIZATION OF THE RAYLEIGH-TAYLOR INSTABILITY IN REGIMES RELEVANT TO INERTIAL CONFINEMENT REGION
J. D. Kilkenny, S. G. Glendinning, S. W. Haan, B. A. Hammel, J. D. Lindl, D. Munro, B. A. Remington, S. V. Weber, J. P. Knauer, and C. P. Verdon Dec. 1993 37 p Presented at the Fall Meeting of the Plasma Physics Division of the American Physical Society, St. Louis, MO, 1-5 Nov. 1993
(Contract W-7405-eng-48)
(DE94-008300; UCRL-JC-115537-Rev-1; CONF-931132-1-Rev-1) Avail: CASI HC A03/MF A01

It has been recognized for many year's that the most significant limitation of ICF is the Rayleigh-Taylor (R-T) instability. It limits the distance an ablatively driven shell can be moved to several times its initial thickness. Fortunately material flow through the unstable region at velocity v(sub A) reduces the growth rate to the square root of kg/(1+kL) minus (beta)kv(sub A) with (beta) from 2-3. In recent years experiments using both x-ray drive and smoothed laser drive to accelerate foils have confirmed our understanding of the ablative R-T instability in planar geometry. The growth of small initial modulations on the foils is measured for growth factors up to 60 for direct drive and 80 for indirect drive. For x-ray drive large stabilization is evident. After some growth, the instability enters the non-linear phase when mode coupling and saturation are also seen and compare well with modeling. Normalized growth rates for direct drive are measured to be higher, but strategies for reduction by raising the isentrope are being investigated. For direct drive, high spatial frequencies are imprinted from the laser beam and amplified by the R-T instability. Modeling shows an understanding of this laser imprinting. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N94-33367 California Univ., San Diego, CA.
THERMAL CONDUCTIVITY AND ULTRASONIC MEASUREMENTS IN LOW-DENSITY SOLID He-4 Ph.D. Thesis
Clement Ambrose Burns 1993 139 p
Avail: Univ. Microfilms Order No. DA9317503

This dissertation contains the results of ultrasonic and thermal conductivity measurements in low density hcp He-4 crystals. Ultrasound of frequencies of 5, 15, and 25 MHz was used. Both velocity and attenuation changes as a function of temperature were measured. The velocity changes were small, and of the same order of magnitude as previous work on high quality crystals, but the attenuation changes did not agree with that expected from either dislocation or vacancies. Thermal conductivity measurements on low density crystals agreed with standard phonon transport theory for high quality single crystals. No contribution from thermally activated vacancies was observed. Limits on the vacancy thermal conductivity and the implications for the properties of the vacancies are discussed. Previous measurements by other authors were re-examined. A careful analysis of this data indicated that for consistency between the different data sets that the vacancies must be delocalized, with a wide band. Dissert. Abstr.

N94-33407# Phytron Instruments, Inc., Mountain View, CA.
A CHARGE DISTRIBUTION ANALYSIS INSTRUMENT FOR CATALYSIS AND MATERIAL SCIENCE APPLICATIONS
F. Freund 1993 16 p
(Contract DE-FG49-93CE-15566)
(DE94-008560; DOE/CE-15566/T1) Avail: CASI HC A03/MF A01

Charge Distribution Analysis (CDA) is a technique to measure mobile charge carriers in dielectric materials in general and more specifically in catalysts. The measurements are based on the dielectric polarization of a

given material in an electric field. They are contact-free and performed at 0 hz under minimum perturbation conditions. It allows one to determine the sign of the majority charge carriers and to obtain information on their diffusive mobility. Under certain conditions the density of surface charges can be measured quantitatively. The density of surface charges is expected to correlate to the catalytic activity. We have proposed to develop CDA modules which could be used in conjunction with commercial thermal analysis equipment, in particular thermobalances and convert them into CDA instruments. The first three months of the project were used to carefully evaluate all options that relate to this development task. We have evaluated the basic concepts for a commercially viable CDA instrument and formulated its design specifications. DOE

N94-33554# Ohio Univ., Athens. Dept. of Electrical and Computer Engineering.

LUMINESCENCE AND ELECTROLUMINESCENCE OF Nd, Tm, AND Yb DOPED GaAs AND SOME II-VI COMPOUNDS Final Report, Jul. 1990 - Nov. 1993

Henryk J. Lozykowski 28 Feb. 1994 89 p

(Grant AF-AFOSR-0322-90)

(AD-A278413; AFOSR-94-0241TR) Avail: CASI HC A05/MF A01

This report describes the progress accomplished during the three years of research on photoluminescence and electroluminescence properties of Nd, Tm, and Yb doped InP, GaAs, CdS, and ZnS. The results are as follows: We developed the kinetics model of energy transfer from the host lattice to the localized core excited state of rare earth isoelectronic structured traps. The energy transfer processes occur through an Auger mechanism where the recombination energy of the bound electron with a free hole is transferred nonradiatively to the core states (or energy can be transferred from the bound exciton on an REI-trap to the core states). If the initial and final states are not resonant, the energy mismatch must be accommodated by emission or absorption of phonons. Furthermore we discuss details of several quenching processes, which are incorporated into the kinetics equations. The derived two sets of differential equations for semi-insulating and n type semiconductors govern the kinetics of rare earth luminescence. The numerically simulated luminescence rise and decay times show a good quantitative agreement with experimental data obtained for InP: Yb over a wide range of excitation intensity. The photoluminescence spectra and decay time also studied as a function of temperature. The new quenching mechanism of ytterbium luminescence involving Yb and Fe ions is proposed. The electric field quenching of InP: Yb photoluminescence was investigated. The photoluminescence kinetics as a function of excitation intensity in n and p type InP: Yb and GaAs: Nd grown by MOCVD was studied at 1.8 K and 77 K. DTIC

N94-33753# Scientific Materials Corp., Bozeman, MT.

MATERIALS FOR SPECTRAL HOLE BURNING RESEARCH, PHASE 1 Final Report, 1 Jun. 1993 - 28 Feb. 1994

R. L. Hutcheson and R. Cone 22 Mar. 1994 58 p

(Contract F49620-93-C-0023)

(AD-A278480; SM-94-0006-Phase-1; AFOSR-94-0233TR-Phase-1) Avail: CASI HC A04/MF A01

Work on the crystal growth and evaluation of crystals for persistent spectral hole burning (PSHB) application has shown good high quality crystals of yttrium silicate, calcium tungstate, and yttria are feasible. Dopants discussed are praseodymium, samarium, and europium. The work shows Sm:two plus is not feasible in calcium tungstate. A sample of Eu:yttrium silicate shows one half homogeneous linewidth of previous Eu:yttrium silicate. DTIC

N94-33774 North Carolina State Univ., Raleigh, NC. Dept. of Materials Science and Engineering.

GROWTH, CHARACTERIZATION, AND DEVICE DEVELOPMENT IN MONOCRYSTALLINE DIAMOND FILMS Quarterly Technical Report, 1 Jan. - 31 Mar. 1994

R. F. Davis, J. T. Glass, R. J. Nemanich, L. Bergman, and M. T. McClure Mar. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-93-I-0437)

(AD-A277863) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Micro- and macro-photoluminescence techniques were employed in this research to investigate the role of nitrogen-doping on the optical spectra of chemical vapor deposited diamond films and to determine whether the origin of the broadband luminescence is due to vibronic interaction of the nitrogen centers. The temperature behavior of the broadband PL and of the 1.681 eV silicon related optical center were analyzed. The intensity of the broadband was found to exhibit a temperature dependence characteristic of optical emission from a continuous distribution of gap states while the temperature dependence of the 1.681 eV band followed the Boltzmann quenching process. Bias-enhanced diamond nucleation on yttrium aluminum garnet (100) was performed in a microwave plasma chemical vapor deposition reactor. The initial results suggest that this nucleation pretreatment technique enhanced diamond nucleation on this substrate. It is proposed that both the yttrium and aluminum are operative on diamond nucleation. The carbide forming nature of these elements is speculated to be an important attribute of these substrates. DTIC

N94-33845 Northwestern Univ., Evanston, IL.

DEFECT STRUCTURE OF SEMICONDUCTING AND INSULATING EPITAXIAL OXIDES

B. W. Wessels Mar. 1994 38 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract DE-FG02-85ER-45209)

(DE94-009650; DOE/ER-45209/8) Avail: CASI HC A03

The investigation has focused on epitaxial growth of BaSrTiO3 over the entire solid solution range, point defects in epitaxial BaTiO3 using temperature-dependent conductivity and deep-level optical spectroscopy, and their nonlinear optical properties. DOE

N94-33856# Xerox Palo Alto Research Center, CA.

THE USE OF SELECTIVE AREA GROWTH FOR THE REDUCTION OF THREADING DISLOCATION DENSITIES IN HETEROEPITAXY Final Report

D. K. Biegelsen and R. D. Bringans 31 Mar. 1994 110 p

(Contract F49620-91-C-0081)

(AD-A278282; AFOSR-94-0229TR) Avail: CASI HC A06/MF A02

The central goal of this project has been the achievement of low defect density GaAs heteroepitaxy on Si by growing mesas with free side walls. Several approaches were used singly and in combination in attempts to guide misfit dislocations (MDs) to the GaAs mesa edges and minimize threading dislocation (TD) densities. Methods included the use of Si pedestals with concave sidewalls, interposed plastically-soft ZnSe buffer layers, graded-composition InGaAs strained layers, and post deposition anneals of the various structures. It was found that, surprisingly, TD densities are hardly reduced by the presence of free sidewalls. Moreover, dislocation interactions during the early stages of growth determined the structure and density of TD's in as-grown films and not thermal mismatch strain during cool down from the growth temperature. It was found that graded-strain layers led to a reduction of dislocation densities by a factor of approximately 15 in films grown over pedestals with convex /111/ facetted sidewalls. It was concluded that to obtain minimum TD densities it is imperative to prevent formation of 90 deg MD's during lattice mismatched heteroepitaxial growth. The structure and thermal stability of interfaces between ZnSe and Si:As(100) were also determined. The observed asymmetric organization of dislocations was shown to arise from the formation and propagation of misfit dislocations on vicinal surfaces. DTIC

N94-33866# Moscow State Univ. (Russia). Nauchno-Isseledovatelskij Inst.

PROCEEDINGS OF THE FOURTH CONFERENCE ON HYPERFINE INTERACTION SPECTROSCOPIC INVESTIGATIONS

V. S. Shpinel, ed. 1992 171 p Conference held in Uzhgorod, Ukraine, 26-28 Jun. 1991

(DE94-614944; INIS-RU-360; CONF-9106451) Avail: CASI HC A08/MF A02 (US Sales Only)

Results of theoretical and experimental investigations on nuclear-spectroscopy of hyperfine interactions are presented. The use of the data for technological and materials science problems is demonstrated. DOE

N94-33877 Brookhaven National Lab., Upton, NY.

CHARACTERIZATION OF DEFECTS IN SI AND SIO2-SI USING POSITRONS

P. Asoka-Kumar and K. G. Lynn 1993 44 p Presented at the International School of Physics on Enrico Fermi on Positron Spectroscopy of Solids, Varenna, Italy, 6-30 Jul. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DE-AC02-76CH-00016)
(DE94-009044; BNL-60112; CONF-9307155-2) Avail: CASI HC A03

Positron annihilation spectroscopy of overlayers, interfaces, and buried regions of semiconductors has seen a rapid growth in recent years. The characteristics of the annihilation gamma rays depend strongly on the local environment of the annihilation sites, and they can be used to probe defect concentrations in a range inaccessible to conventional defect probes. Some of the recent success of the technique in examining low concentrations of point defects in technologically important Si-based structures is discussed. DOE

N94-33914# Oak Ridge National Lab., TN.
EFFECT OF PRESSURE ON ARSENIC DIFFUSION IN GERMANIUM
S. Mitha, S. D. Theiss, M. J. Aziz, D. Schiferl, and D. B. Poker Jan. 1994 7 p Presented at the Fall Meeting of the Materials Research Society, Boston, MA, 29 Nov. - 3 Dec. 1993
(Contract DE-AC05-84OR-21400)
(DE94-009451; CONF-931108-99) Avail: CASI HC A02/MF A01

We report preliminary results of a study of the activation volume for diffusion of arsenic in germanium. High temperature, high pressure anneals were performed in a liquid argon pressure medium in a diamond anvil cell capable of reaching 5 GPa and 750 C, which is externally heated for uniform and repeatable temperature profiles. Broadening of an ion-implanted arsenic profile was measured by secondary ion mass spectrometry. Hydrostatic pressure retards the diffusivity at 575 C, characterized by an activation volume that is +15% of the atomic volume of Ge. Implications for diffusion mechanisms are discussed. DOE

N94-33969# State Univ. of New York, Stony Brook, NY. Dept. of Physics.
SEMICONDUCTOR SINGLE-ELECTRON DIGITAL DEVICES AND CIRCUITS Annual Progress Report
D. V. Averin 20 Jun. 1993 61 p
(Contract N00014-93-1-0880)
(AD-A278338) Avail: CASI HC A04/MF A01

Research objectives were the theoretical investigation of single-electron tunneling phenomena in semiconductor heterostructures, and their application possibilities in the development of ultradense logic and memory circuits. Report period objectives are: (1) to design and model simple digital circuits based on capacitively coupled single-electron transistors; and (2) to extend the orthodox theory of correlated single-electron tunneling to ultrasmall quantum dots. DTIC

N94-34072*# Alabama Univ., Huntsville, AL.
AUTOMATED DOCUMENTATION GENERATOR FOR ADVANCED PROTEIN CRYSTAL GROWTH Final Technical Report, 3 Mar. 1993 - 10 Mar. 1994
Gary A. Maddux, Anna Provancha, and David Chattam 10 Mar. 1994 204 p
(Contract NAS8-38609)
(NASA-CR-193955; NAS 1.26:193955; UAH-5-33192) Avail: CASI HC A10/MF A03

To achieve an environment less dependent on the flow of paper, automated techniques of data storage and retrieval must be utilized. This software system, 'Automated Payload Experiment Tool,' seeks to provide a knowledge-based, hypertext environment for the development of NASA documentation. Once developed, the final system should be able to guide a Principal Investigator through the documentation process in a more timely and efficient manner, while supplying more accurate information to the NASA payload developer. The current system is designed for the development of the Science Requirements Document (SRD), the Experiment Requirements Document (ERD), the Project Plan, and the Safety Requirements Document. Author (revised)

N94-34082 PD-LD, Inc., Princeton, NJ.
INFRARED DETECTORS BASED ON Si/SiGe SUPERLATTICES AND SILICIDE/SiGe SCHOTTY BARRIERS OPERATING BEYOND 12 MICROMETERS Final Report, 1 Jul. - 31 Dec. 1993
Vladimir S. Ban 15 Feb. 1994 24 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-93-C-0042)
(AD-A277900; AFOSR-94-0134TR) Avail: CASI HC A03

Work performed in phase 1 of this project clearly established the feasibility of using SiGe detectors in the LWIR region. The most important achievements are both Schottky barrier and multiquantum well structures based on SiGe alloys and capable of detection in the LWIR region have been grown by the RTCVD epitaxial growth method. For the first time, the selective epitaxial growth of LWIR SiGe detectors on silicon substrates with CMOS circuitry has been demonstrated, thus showing that monolithically integrated detector-multiplexer structures are feasible; Schottky barrier detectors with cut-off wavelengths exceeding 10 micrometers have been demonstrated; Extensive spectral response, cut-off wavelength and dark current measurements for Schottky barrier detectors based on Pt silicide/SiGe alloys with Ge content ranging from 0 to 20%, have been carried out and are discussed. DTIC

N94-34085 Electronic Materials Engineering, Camarillo, CA.
DYNAMICS OF SUPERMATRIX SEMICONDUCTOR GROWTH Final Report, 25 Sep. 1990 - 24 Dec. 1993
Douglas E. Holmes and Linda Koo 24 Dec. 1993 34 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-90-C-0087)
(AD-A278380; AFOSR-94-0185TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

Electronic Materials Engineering and AFOSR have demonstrated a new semiconductor materials technology for electronic and optoelectronic device applications: the Supermatrix Semiconductor (SMS). SMS makes possible the 3-dimensional superlattice and a new method for engineering the properties of semiconductor materials through the synergy of 3-dimensional microstructural ordering. A CrGaAs SMS has been produced in Ingot form (2 in. long and 1 in. diameter) exhibiting a periodic rod-matrix microstructure over wafer-scale distances. Electronic, optical, and structural properties were characterized by PPL, SIMS, RBS, Auger, and x-ray diffraction and correlated to conditions of solidification. It was demonstrated that the cubic degeneracy of GaAs in the CrGaAs matrix is lifted as a result of anisotropic stress and leads to birefringence. Advances in practical processing of SMS materials, including polishing, have also been achieved to support future device development activities. DTIC

N94-34166# Brookhaven National Lab., Upton, NY.
RELAXATION OF RADIATION DAMAGES IN SILICON PLANAR DETECTORS
V. Eremin (Academy of Sciences, USSR, Saint Petersburg, USSR.), A. Ivanov (Academy of Sciences, USSR, Saint Petersburg, USSR.), N. Storkan (Academy of Sciences, USSR, Saint Petersburg, USSR.), E. Verbitskaya (Academy of Sciences, USSR, Saint Petersburg, USSR.), Zheng Li, and B. Schmidt Dec. 1993 19 p Presented at the 1st International Conference on Large Scale Applications and Radiation Hardness of Semiconductor Detectors, Florence, Italy, 7-9 Jul. 1993
(Contract DE-AC02-76CH-00016)
(DE94-009084; BNL-49807; CONF-9307163-3) Avail: CASI HC A03/MF A01

The behavior of radiation induced carbon related defects in high resistivity silicon detectors has been investigated. The defects were introduced by alpha-particle irradiation and the measurements were carried out by the DLTS-technique. The unusual defect behavior consists in low temperature annealing, including self annealing at room temperature, of the interstitial carbon C(sub i) with the simultaneous increase of the (C(sub i)-O(sub i))-complex concentration. The kinetic parameters of the process have been determined from the increase of the C(sub i)-center concentration versus time. Two annealing velocities have been observed, which are due to different heat treatments during the detector fabrication process. DOE

N94-34405 Department of the Navy, Washington, DC.
METHOD FOR FORMING ALIGNED SUPERCONDUCTING Bi-SR-CA-CU-O Patent
Louis E. Toth, inventor (to Navy) and J. R. Spann, inventor (to Navy) 21 Dec. 1993 11 p Filed 21 Mar. 1990

(AD-D016192; US-Patent-5,272,131; US-Patent-Appl-SN-497175; US-Patent-Class-B05D3-02) Avail: US Patent and Trademark Office

A process is provided for forming an oriented thick film superconducting coating on a polycrystalline substrate. The coating includes at least two highly oriented compounds of Bi(a)Sr(b)Ca(c)Cu(d)O(x) (BSCCO) wherein, in one component, a is 2, b is 2, c is 1, d is 2, and x is 8 and, in another component, a is 2, b is 2, c is 0, d is 1, and x is approximately 6. The process comprising applying a powdered mixture prepared from BiO3, SrCO3, CaCO3, and CuO onto a polycrystalline substrate: rapidly heating the resultant coated substrate to a temperature of from about 1000-1100 C for a period of about 30 minutes, thereby melting the powder and forming a thick film coating; rapidly quenching the coated substrate below which phase transition occurs; and annealing the resultant coated substrate by heating in an atmosphere of an oxygen-containing gas to a temperature of from about 850-870 C. DTIC

N94-35081# Sandia National Labs., Albuquerque, NM.
CRITICAL ANALYSIS BY WAY OF HOLE ETCHING WITH A MANUFACTURABLE RIE PROCESS USING SICI4 AND BCI3 AND CI2 CHEMISTRIES
M. L. Lovejoy, R. J. Shul, D. J. Rieger, and C. Constantine 1993 4 p Presented at the 1994 Conference on GaAs Manufacturing, Las Vegas, NV, 2-5 May 1994
(Contract DE-AC04-94AL-85000)
(DE94-007736; SAND-93-2637C; CONF-940588-2) Avail: CASI HC A01/MF A01

A manufacturable RIE (reactive ion etching) process for via hole etching is critically analyzed to optimize a non-CFC, environmentally favorable etch process. The strong effect on via hole profile and etch rates due to various thicknesses of wafer carriers that are used for mechanical support during the processing of 50--100 micron GaAs wafers and of the corresponding cathode covering materials are studied. An optimized via hole process that uses a single-apply photoresist (PR) process with high etch rates is presented. DOE

N94-34345# Kunming Inst. of Tech. (China). Dept. of Automation.
MODELLING AND OPTIMAL CONTROL OF Pb-Sn CONTINUOUS CRYSTALLIZATION PROCESS
Xiang-Zhen Zeng and Xiao-Ming Jin *In* Nanjing Aeronautical Inst., Proceedings of the Asia-Pacific Conference on Control and Measurement (APCCM 1993), Volume 10, No. 1 1993 p 164-168 (For primary document see N94-34308 10-63)
Avail: CASI HC A01/MF A03

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N94-33865# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ON GAUGE TRANSFORMATIONS IN CONSTRAINED THEORIES
S. A. Gogilidze, V. V. Sanadze, Yu. S. Surovtsev, and F. G. Tkebuchava 1992 11 p
(DE94-614440; JINR-R-2-92-554) Avail: CASI HC A03/MF A01 (US Sales Only)

The method for constructing infinitesimal gauge transformations for an arbitrary degenerate without any restrictions on the algebra of constraints is suggested. Thereby, it is proved in the general case that the generation of the theory is caused by its gauge invariance. DOE

N94-33929# Stanford Research Inst., Menlo Park, CA. Linear Accelerator Center.
STAPP'S QUANTUM DUALISM: THE JAMES AND HEISENBERG MODEL OF CONSCIOUSNESS
H. P. Noyes 18 Feb. 1994 9 p Presented at the 10th Annual Meeting of the Alternative Natural Philosophy Association, Stanford, CA, 19-21 Feb. 1994
(Contract DE-AC03-76SF-00515)
(DE94-009028; SU-SLAC-PUB-6440; CONF-940270-1) Avail: CASI HC A02/MF A01

Henry Stapp attempts to resolve the Cartesian dilemma by introducing what the author would characterize as an ontological dualism between mind and matter. His model for mind comes from William James' description of conscious events and for matter from Werner Heisenberg's ontological model for quantum events (wave function collapse). His demonstration of the isomorphism between the two types of events is successful, but in the author's opinion fails to establish a monistic, scientific theory. The author traces Stapp's failure to his adamant rejection of arbitrariness, or 'randomness.' This makes it impossible for him (or for Bohr and Pauli before him) to understand the power of Darwin's explanation of biology, let alone the triumphs of modern 'neo-Darwinism.' The author notes that the point at issue is a modern version of the unresolved opposition between Leucippus and Democritus on one side and Epicurus on the other. Stapp's views are contrasted with recent discussions of consciousness by two eminent biologists: Crick and Edelman. They locate the problem firmly in the context of natural selection on the surface of the earth. Their approaches provide a sound basis for further scientific work. The author briefly examines the connection between this scientific (rather than ontological) framework and the new fundamental theory based on bit-strings and the combinatorial hierarchy. DOE

N94-33984# Stanford Research Inst., Menlo Park, CA. Linear Accelerator Center.
DECOHERENCE, DETERMINISM AND CHAOS
H. P. Noyes Jan. 1994 12 p Presented at the 15th Annual International Meeting of the Alternative Natural Philosophy Association, Cambridge, England, 9-12 Sep. 1993
(Contract DE-AC03-76SF-00515)
(DE94-009018; SU-SLAC-PUB-6397; CONF-9309358-1) Avail: CASI HC A03/MF A01

The author claims by now to have made his case that modern work on fractals and chaos theory has already removed the presumption that classical physics is 'deterministic'. Further, he claims that in so far as classical relativistic field theory (i.e. electromagnetism and gravitation) are scale invariant, they are self-consistent only if the idea of 'test-particle' is introduced from outside the theory. Einstein spent the last years of his life trying to use singularities in the metric as 'particles' or to get them out of the nonlinearities in a grand unified theory, in vain. So classical physics in this sense cannot be the fundamental theory. However, the author claims to have shown that if he introduces a 'scale invariance bounded from below' by measurement accuracy, then Tanimura's generalization of the Feynman proof as reconstructed by Dyson allows him to make a consistent classical theory for decoherent sources sinks. Restoring coherence to classical physics via relativistic action at a distance is left as a task for the future. Relativistic quantum mechanics, properly reconstructed from a finite and discrete basis, emerges in much better shape. The concept of particles has to be replaced by no-yes particulate events, and particle-antiparticle pair creation and annihilation properly formulated. DOE

N94-33988# Texas Univ., Austin, TX. Center for Particle Physics.
LOCALIZABILITY AND THE PLANCK MASS
Y. Neeman Jun. 1993 5 p
(Contract DE-FG05-85ER-40200)
(DE94-009183; DOE/ER-40200/326; TAUP/N-231-93) Avail: CASI HC A01/MF A01

The author combines the assumption of environmental decoherence, as the mechanism generating the classical (i.e. no quantum interferences) nature of spacetime, with the limit on its other classical feature, point-like continuity, namely Planck length. As a result, quantum extended objects with masses larger than Planck mass have to derive their quantum behavior from long-range correlations; objects with masses smaller than Planck mass cannot display classical behavior. DOE

N94-33989# Texas Univ., Austin, TX. Center for Particle Physics.
CHROMOGRAVITY EXPLAINS STRONG GRAVITY
Y. Neeman and D. Sijacki Mar. 1993 11 p

(Contract DE-FG05-85ER-40200)
(DE94-009184; DOE/ER-40200/324; TAUP/N-228-93) Avail: CASI HC A03/MF A01

In this paper the authors deal with the question of gravitational type interactions in the case of strong interaction phenomena. They present arguments which indicate that it is not necessary to invoke a gravity type interaction into QCD in order to account for observed phenomena. They argue that the gravitational type phenomena discussed in previous work is a manifestation of a class of Feynmann diagrams. These seem to generate an analog to gravity, a J=2 'chromograviton' or 'pseudo-graviton' whose action effectively generates Salam's 'strong gravity' or 'f-gravity,' without having to introduce the theory as an additional input. DOE

N94-34099# Los Alamos National Lab., NM.
DECOHERENCE, CHAOS, THE QUANTUM AND THE CLASSICAL
W. H. Zurek and J. P. Paz 1994 16 p Presented at the 1993 Symposium on the Foundations of Modern Physics, Cologne, Germany, 1-6 Jun. 1993
(Contract W-7405-eng-36)
(DE94-009317; LA-UR-94-1154; CONF-9306255-2) Avail: CASI HC A03/MF A01

The key ideas of the environment-induced decoherence approach are reviewed. Application of decoherence to the transition from quantum to classical in open quantum systems with chaotic classical analogs is described. The arrow of time is, in this context, a result of the information loss to the correlations with the environment. The asymptotic rate of entropy production (which is reached quickly, on the dynamical timescale) is independent of the details of the coupling of the quantum system to the environment, and is set by the Lyapunov exponents. We also briefly outline the existential interpretation of quantum mechanics, justifying the slogan, no information without representation. DOE

N94-33482*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THEORETICAL STUDY OF THERMODYNAMIC PROPERTIES AND REACTION RATES OF IMPORTANCE IN THE HIGH-SPEED RESEARCH PROGRAM
Stephen Langhoff, Charles Bauschlicher, and Richard Jaffe *In* NASA. Langley Research Center, First Annual High-Speed Research Workshop, Part 2 Apr. 1992 p 967-980 (For primary document see N94-33462 10-02)
Avail: CASI HC A03/MF A04

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N94-33575* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
INDIANAPOLIS CIP REVIEW (Videotape)
Dec. 1988 Videotape: 14 min. 35 sec. playing time, in color, with sound
(NASA-TM-109821; NONP-VT-94-12949) Avail: CASI VHS A01/BETA A22

This video presents the community involvement program at the Indianapolis Children's Museum and Indianapolis Art League. CASI

N94-34169# National Science Foundation, Arlington, VA. National Science Board.
SCIENCE AND ENGINEERING INDICATORS, 1993
1993 540 p Original contains color illustrations
(NSB-93-1) Avail: CASI HC A23/MF A04; SOD HC

U.S. science, engineering, and technology trends are described in a global context, and insights on how investments and priorites are changing over time are provided. Science and technology (S&T) human resources, in all their diversity, are essential to our economy and national security. Therefore, information on the science and engineering (S&E) pipeline--precollege education, higher education, and the S&E workforce--is presented. In a democracy such as our own, public attitudes and public understanding are of major importance and have an impact on decisions in both the private and public sectors. Therefore, the report presents information on science and technology in a societal context. Derived from text

N94-34717* Modern Technology Systems, Inc., Riverdale, MD.
SUMMER HIGH SCHOOL APPRENTICESHIP RESEARCH PROGRAM (SHARP) Final Report
1993 50 p
(Contract NASw-4779)
(NASA-CR-195956; NAS 1.26:195956) Avail: Issuing Activity (NASA Headquarters, Washington, DC, Attn: Code FEE)

The NASA Summer High School Apprenticeship Research Program (SHARP) completed it's fourteenth year of operation in 1993. A total of 220 talented high school students gained first hand knowledge about science and engineering careers by working directly with a NASA scientist or engineer during the summer at nine participating NASA facilities. This year's program continued the tradition of providing students with quality experiences that meet the SHARP high standard of excellence. Derived from text

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N94-33581* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE SECOND GIANT LEAP (Videotape)
1991 Videotape: 15 min. 5 sec. playing time, in color, with sound
(NASA-TM-109827; NONP-VT-94-12955) Avail: CASI VHS A01/BETA A22

This video describes the purpose and activities of the Office of Space Commercialization at LeRC. The office promotes interactions between industry and NASA researchers, and promotes the benefits of microgravity research. Examples of knowledge transfer in the production of airplanes and farm equipment are shown. CASI

N94-33947# Committee on Commerce, Science, and Transportation (U.S. Senate).
NOMINATION OF DANIEL S. GOLDIN TO BE ADMINISTRATOR OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1992 50 p Hearing before the Committee on Commerce, Science, and Transportation, 102nd Congress, 2nd Session, 27 Mar. 1992
(S-Hrg-102-744; GPO-57-896; ISBN-0-16-039126-1) Avail: Committee on Commerce, Science, and Transportation, Senate, Washington DC 20510

Written statements and verbal testimony was presented as part of the hearing to consider the nomination of Daniel S. Goldin to be administrator of NASA. Mr. Goldin was nominated to replace Richard Truly, who resigned from this position, effective April 1, 1992. CASI

N94-33615*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE VIRTUAL MISSION OPERATIONS CENTER
Mike Moore and Jeffrey Fox *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 345-355 (For primary document see N94-33612 10-99)
(Contract DE-AC06-76RL-01830)
Avail: CASI HC A03/MF A03

N94-33616*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
MISSION OPERATIONS AND COMMAND ASSURANCE: FLIGHT OPERATIONS QUALITY IMPROVEMENTS
Linda L. Welz, Kristin J. Bruno, Sheri L. Kazz, Sherrill S. Potts, and Mona M. Witkowski *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 356-362 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34046*# Carnegie-Mellon Univ., Pittsburgh, PA. The Robotics Institute.
CONSTRAINT-BASED INTEGRATION OF PLANNING AND SCHEDULING FOR SPACE-BASED OBSERVATORY MANAGEMENT
Nicola Muscettola and Steven F. Smith *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 200-206 (For primary document see N94-34019 10-99)
(Contracts NCC2-531; F30602-90-C-0119)
Avail: CASI HC A02/MF A04

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

For computer documentation see *61 Computer Programming and Software.*

N94-33371*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 24: A GENERAL APPROACH TO MEASURING THE VALUE OF AEROSPACE INFORMATION PRODUCTS AND SERVICES
Herbert R. Brinberg (Parnassus Associates International, New York, NY.) and Thomas E. Pinelli Jan. 1993 16 p Presented at the 31st Aerospace Sciences Meeting and Exhibits of the American Institute of Aeronautics and Astronautics, Reno, NV, 13 Jan. 1993 See also A93-17511
(NASA-TM-109775; NAS 1.15:109775; AIAA Paper 93-0580) Avail: CASI HC A03/MF A01

This paper discusses the various approaches to measuring the value of information, first defining the meanings of information, economics of information, and value. It concludes that no general model of measuring the value of information is possible and that the usual approaches, such as cost/benefit equations, have very limited applications. It also concludes that in specific contexts with given goals for newly developed products and services or newly acquired information there is a basis for its objective valuation. The axioms and inputs for such a model are described and directions for further verification and analysis are proposed. Author

N94-33401 Kestrel Inst., Palo Alto, CA.
REPORT OF THE WORKSHOPS: AUTOMATED GENERATION OF ELECTRONIC TECHNICAL MANUALS Final Report, Oct. 1992 - Feb. 1993
David L. Zimmerman, Cordell Green, Bert Dimock, David R. Gunning, and Gary Worrall Dec. 1993 55 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F33601-93-M-Y842)
(AD-A278046; AL/HR-TP-1993-0036) Avail: CASI HC A04

Paper-based technical manuals are expensive to produce and maintain, difficult to update and modify, and bulky and inflexible in the field. They are fast approaching their practical limit in coping with the complexity of modern Air Force weapons systems. The next 10 to 15 years hold the promise of a revolution, triggered by emerging technologies, in the production and presentation of aircraft maintenance information. This report describes a vision of integrated and electronically based maintenance information support in the future and suggests the specific research and development goals necessary to achieve that vision. The report identifies a number of emerging technologies which will enable maintenance instructions to be created and managed more efficiently, and used more effectively, than they are now. Outlined herein are the essential advancements needed to migrate from a costly and cumbersome world of paper production to the lean world of digital production and delivery. Success in these pursuits will bring enormous benefits both within the economy of human-centered design technology for concurrent engineering and in the performance of maintenance personnel. DTIC

N94-33419 California Univ., Los Angeles, CA.
SEQUENCING ITEMS IN MULTIPLE-ITEM DISPLAYS ON ONLINE PUBLIC ACCESS CATALOGS Ph.D. Thesis
David Mark Abels 1993 214 p
Avail: Univ. Microfilms Order No. DA9317886

Experiments on the sequencing affects of four display sequences, Author, Title, Publication Year, and Random, of multiple-item displays on Online Public Access Catalogs (OPAC's) were designed and tested for three scanning tasks. The tasks were derived from a model of OPAC for three scanning behavior of multiple-item displays of item descriptions retrieved by a subject search. The model defined the scanning behavior of a user as one in which a user applies criteria in addition to the actual subject searched in order to identify items pertinent to his retrieval objective. The model identified three criteria that a user can apply: authorship, currentness, and subject-relatedness. Scanning behaviors in which two criteria were applied at the same time by a user to meet a specified retrieval objective were investigated. The effectiveness of a display was measured by its scannability, the elapsed time taken to scan the display to identify relevant items. Also investigated were the effects of field order -- the order of the bibliographic elements in the item descriptions -- on display scannability, and whether there was an interaction between display sequence and field order. The findings showed that when authorship was one of two criteria applied by a user, the most effective displays were ones in which the items were sequenced by author and in which the left-most element in the item descriptions was the author. The other bibliographic element did not positively affect user performance either when used to sequence displays or when used in the left-most position. These findings suggested that authorship take precedence over any other criterion when applied jointly with another criterion in scanning displays from a subject search. When currentness and subject-relatedness were the two criterion applied, the bibliographic element supplying currentness information resulted in more effective displays, both when used to sequence the items and as the left-most field in the item description. Sequencing items randomly, as is currently done in some operational OPAC's, never had a positive effect on user performance. Sequences in which the bibliographic element used to sequence was unrelated to the criteria being applied produced significantly slower scannability than the most effective sequence.
Dissert. Abstr.

N94-33596# Energy Information Administration, Washington, DC.
EIA DIRECTORY OF ELECTRONIC PRODUCTS, FOURTH QUARTER 1993
23 Feb. 1994 75 p
(DE94-007368; DOE/EIA-0569(93-4Q)) Avail: CASI HC A04/MF A01

The Energy Information Administration (EIA) makes available for public use a series of machine-readable data files and computer models. The data files and models are made available to the public on magnetic tapes. In addition, selected data files/models are available on diskette for IBM-compatible personal computers. For each product listed in this directory, a detailed abstract is provided which describes the data published. DOE

N94-33711# Argonne National Lab., IL.
DATA CONSIDERATIONS FOR MODELBASES
R. J. Sutter, R. E. Kero, and A. P. Campbell 1993 9 p Presented at the Military Operations Research Society Mini Symposium on Simulation Data and its Management, Falls Church, VA, 16-18 Nov. 1993
(Contract W-31-109-eng-38)
(DE94-004614; ANL/DIS/CP-81216; CONF-9311148-1) Avail: CASI HC A02/MF A01

With increased emphasis on improving the approach toward model and simulation development, modelbase architectures offer one potential solution for solving interoperability and code reuse problems, as well as for providing a method to guide investment strategies. The adoption of a modelbase concept will require new approaches toward data sources: their definitions, their usage regulations, their life-cycle management, as well as their accessibility during the construction of models and simulations. To support future modelbase development and the construction of new models and simulations, this paper will address the need for: (1) self-describing data, (2) true data independence from application software, (3) multiple levels of granularity in data, and (4) dynamic module-specific data validation. In conjunction with these topics, the production and consumption of identifiable data by modelbase modules will also be described. The paper

will address the bipartite structure of data-instantiated data together with its associated meta data, as well as the accessibility and potential uses of both of these information sources. This effort goes far beyond a common data dictionary since the data must not only describe itself, but also its valid uses. The current and future role of data dictionaries will be discussed in terms of this new nature of data required by future Modeling and Simulation (M & S) efforts. DOE

N94-33730# Energy Technology Data Exchange, Oak Ridge, TN.
INTERNATIONAL ENERGY: SUBJECT THESAURUS, REVISION 1
1993 1120 p
(DE94-002590; ETDE/PUB-2-Rev-1) Avail: CASI HC A99/MF A10

The Subject Thesaurus contains the standard vocabulary of indexing terms (descriptors) developed and structured to build and maintain energy information databases. Involved in this cooperative task are (1) the technical staff of the USDOE Office of Scientific and Technical Information (OSTI) in cooperation with the member countries of the International Energy Agency's Energy Technology Data Exchange (ETDE), and (2) the International Atomic Energy Agency's International Nuclear Information System (INIS) staff representing the more than 100 countries and organizations that record and index information for the international nuclear information community. ETDE member countries are also members of INIS. Nuclear information prepared for INIS by ETDE member countries is included in the ETDE Energy Database, which contains the online equivalent of the printed INIS Atomindex. Indexing terminology is therefore cooperatively standardized for use in both information systems. This structured vocabulary reflects the scope of international energy research, development, and technological programs. The terminology of this thesaurus aids in subject searching on commercial systems, such as 'Energy Science & Technology' by DIALOG Information Services, 'Energy' by STN International and the 'ETDE Energy Database' by SilverPlatter. It is also the thesaurus for the Integrated Technical Information System (ITIS) online databases of the US Department of Energy. DOE

N94-33791*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE THIRD NASA GODDARD CONFERENCE ON MASS STORAGE SYSTEMS AND TECHNOLOGIES
Benjamin Kobler, ed. and P. C. Hariharan, ed. Washington Apr. 1993 493 p Conference held in College Park, MD, 19-21 Oct. 1993
(RTOP 505-00-00)
(NASA-CP-3262; Rept-94B00057; NAS 1.55:3262) Avail: CASI HC A21/MF A04

This report contains copies of nearly all of the technical papers and viewgraphs presented at the Goddard Conference on Mass Storage Systems and Technologies held in October 1993. The conference served as an informational exchange forum for topics primarily relating to the ingestion and management of massive amounts of data and the attendant problems involved. Discussion topics include the necessary use of computers in the solution of today's infinitely complex problems, the need for greatly increased storage densities in both optical and magnetic recording media, currently popular storage media and magnetic media storage risk factors, data archiving standards including a talk on the current status of the IEEE Storage Systems Reference Model (RM). Additional topics addressed System performance, data storage system concepts, communications technologies, data distribution systems, data compression, and error detection and correction. For individual titles, see N94-33792 through N94-33829.

N94-33792*# National Storage Industry Consortium, San Diego, CA.
THE UNITED STATES DIGITAL RECORDING INDUSTRY
John L. Simonds *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 7-13 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

The recording industry resembles the semiconductor industry in several aspects. Both are large (greater than $60 Billion/year revenues); both are considered critical technologies supporting national objectives; both are experiencing increased competition from foreign suppliers; they recognize significant opportunities for both technological and market growth in the decade to come; and both realize that a key to this future growth lies in alliances among industry, academia, and government. The semiconductor industry has made significant investments in alliances relating to manufacturing technologies (SEMATECH) and to joint long-term technology research centered in universities (SRC). The federal government has provided funding support of these efforts in recognition of the critical roles semiconductor technologies play in national interests. The recording industry is now also forming critical alliances, but has been slower in starting and in gaining broad recognition by government agencies and legislators that the industry needs federal support. Traditionally, the recording industry has been viewed as mature, stable, and, while critical to national interests, able to chart and fund its own course toward future national needs. That perception is fortunately changing. Derived from text

N94-33793*# IBM Federal Systems Div., Houston, TX.
TOWARD A DIGITAL LIBRARY STRATEGY FOR A NATIONAL INFORMATION INFRASTRUCTURE
Robert A. Coyne and Harry Hulen *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 15-18 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

Bills currently before the House and Senate would give support to the development of a National Information Infrastructure, in which digital libraries and storage systems would be an important part. A simple model is offered to show the relationship of storage systems, software, and standards to the overall information infrastructure. Some elements of a national strategy for digital libraries are proposed, based on the mission of the nonprofit National Storage System Foundation. Author

N94-33794*# Advanced Measurement Systems, Inc., Chantilly, VA.
MAGNETIC FIELD SOURCES AND THEIR THREAT TO MAGNETIC MEDIA
Steve Jewell *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 19-30 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

Magnetic storage media (tapes, disks, cards, etc.) may be damaged by external magnetic fields. The potential for such damage has been researched, but no objective standard exists for the protection of such media. This paper summarizes a magnetic storage facility standard, Publication 933, that ensures magnetic protection of data storage media. Author

N94-33795*# Minnesota Mining and Mfg. Co., Saint Paul, MN.
HIGH PERFORMANCE QUARTER-INCH CARTRIDGE TAPE SYSTEMS
c35
Ted Schwarz *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 31-43 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

Within the established low cost structure of Data Cartridge drive technology, it is possible to achieve nearly 1 terrabyte (10(exp 12)) of data capacity and more than 1 Gbit/sec (greater than 100 Mbytes/sec) transfer rates. The desirability to place this capability within a single cartridge will be determined by the market. The 3.5 in. or smaller form factor may suffice to serve both the current Data Cartridge market and a high performance segment. In any case, Data Cartridge Technology provides a strong sustainable technology growth path in the 21st century. Author

N94-33796*# Southwall Corp., Palo Alto, CA.
A NEW TAPE PRODUCT FOR OPTICAL DATA STORAGE
T. L. Larsen, F. E. Woodard, and S. J. Pace *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 45-50 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

A new tape product has been developed for optical data storage. Laser data recording is based on hole or pit formation in a low melting metallic alloy system. The media structure, sputter deposition process, and media characteristics, including write sensitivity, error rates, wear resistance, and archival storage are discussed. Author

N94-33797*# Imperial Chemical Industries Ltd., Brantham (England).
CERTIFICATION OF ICI 1012 OPTICAL DATA STORAGE TAPE

J. M. Howell *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 51-55 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

ICI has developed a unique and novel method of certifying a Terabyte optical tape. The tape quality is guaranteed as a statistical upper limit on the probability of uncorrectable errors. This is called the Corrected Byte Error Rate or CBER. We developed this probabilistic method because of two reasons why error rate cannot be measured directly. Firstly, written data is indelible, so one cannot employ write/read tests such as used for magnetic tape. Secondly, the anticipated error rates need impractically large samples to measure accurately. For example, a rate of 1E-12 implies only one byte in error per tape. The archivability of ICI 1012 Data Storage Tape in general is well characterized and understood. Nevertheless, customers expect performance guarantees to be supported by test results on individual tapes. In particular, they need assurance that data is retrievable after decades in archive. This paper describes the mathematical basis, measurement apparatus and applicability of the certification method.
Derived from text

N94-33798*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ROLE OF FORMATS IN THE LIFE CYCLE OF DATA
Don Sawyer *In its* The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 65-74 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

This paper's perspective is based on the author's experience generating, analyzing, archiving, and distributing data obtained from satellites, and on the experience gained in data modeling and the development of standards for data understanding under the Consultative Committee for Space Data Systems (CCSDS). Data formats are used to represent all information in digital form, and thus play a major role in all interchanges and access to this information. The need to more efficiently manage and process rapidly growing quantities of data, and to preserve the information contained therein, continue to drive a great interest in data formats. The purpose of this paper is to examine the role of formats as they support the use of data within a space agency. The life-cycle identified is only one of many variations that would be recognized by those familiar with the 'space business', however it is expected that most of the issues raised will be pertinent to other 'space business' life cycles and to other 'non-space' disciplines as well.
Derived from text

N94-33799*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A REFERENCE MODEL FOR SCIENTIFIC INFORMATION INTERCHANGE
Lou Reich (Computer Sciences Corp., Beltsville, MD.), Don Sawyer, and Randy Davis *In its* The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 75-97 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

This paper presents an overview of an Information Interchange Reference Model (IIRM) currently being developed by individuals participating in the Consultative Committee for Space Data Systems (CCSDS) Panel 2, the Planetary Data Systems (PDS), and the Committee on Earth Observing Satellites (CEOS). This is an ongoing research activity and is not an official position by these bodies. This reference model provides a framework for describing and assessing current and proposed methodologies for information interchange within and among the space agencies. It is hoped that this model will improve interoperability between the various methodologies. As such, this model attempts to address key information interchange issues as seen by the producers and users of space-related data and to put them into a coherent framework. Information is understood as the knowledge (e.g., the scientific content) represented by data. Therefore, concern is not primarily on mechanisms for transferring data from user to user (e.g., compact disk read-only memory (CD-ROM), wide-area networks, optical tape, and so forth) but on how information is encoded as data and how the information content is maintained with minimal loss or distortion during transmittal. The model assumes open systems, which means that the protocols or methods used should be fully described and the descriptions publicly available. Ideally these protocols are promoted by recognized standards organizations using processes that permit involvement by those most likely to be affected, thereby enhancing the protocol's stability and the likelihood of wide support.
Derived from text

N94-33800*# National Archives and Records Service, Washington, DC.
PRESERVING ELECTRONIC RECORDS: NOT THE EASIEST TASK
Fynnette Eaton *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 99-102 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

The National Archives and Records Administration has had a program for accessioning, describing, preserving and providing reference service to the electronic records (machine-readable records) created by Federal agencies for more than twenty years. Although there have been many changes in the name of the office, its basic mission has remained the same: to preserve and make available those records created by Federal agencies that the National Archives has determined to have value beyond the short-term need of the originating agency. A phrase that was once coined for a preservation conference still applies: the National Archives, when it decides to accept the transfer of records into its custody, is committing itself to preserving these records for perpetuity.
Derived from text

N94-33801*# National Climatic Data Center, Asheville, NC.
NCDC MASS STORAGE SYSTEMS AND TECHNOLOGIES
Dick Davis *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 121-124 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

National Climatic Data Center (NCDC) data management issues are discussed, such as nature of holdings, history of the site, popularity of data sets, media/technology used for storage, volume distributed per month, mode of distribution, most frequently encountered problems, type of media requested/used, and evolution of media. Current holdings at NCDC are 107.8 terabytes of digital data and about 0.3 terabytes of manuscript data. The nexrad radar system is expected to generate approximately 88 terabytes per year by 1996.
CASI

N94-33802*# Triada Ltd., Ann Arbor, MI.
A PETABYTE SIZE ELECTRONIC LIBRARY USING THE N-GRAM MEMORY ENGINE
Joseph M. Bugajski *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 125-136 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

A model library containing petabytes of data is proposed by Triada, Ltd., Ann Arbor, Michigan. The library uses the newly patented N-Gram Memory Engine (Neurex), for storage, compression, and retrieval. Neurex splits data into two parts: a hierarchical network of associative memories that store 'information' from data and a permutation operator that preserves sequence. Neurex is expected to offer four advantages in mass storage systems. Neurex representations are dense, fully reversible, hence less expensive to store. Neurex becomes exponentially more stable with increasing data flow; thus its contents and the inverting algorithm may be mass produced for low cost distribution. Only a small permutation operator would be recalled from the library to recover data. Neurex may be enhanced to recall patterns using a partial pattern. Neurex nodes are measures of their pattern. Researchers might use nodes in statistical models to avoid costly sorting and counting procedures. Neurex subsumes a theory of learning and memory that the author believes extends information theory. Its first axiom is a symmetry principle: learning creates memory and memory evidences learning. The theory treats an information store that evolves from a null state to stationarity. A Neurex extracts information data without a priori knowledge; i.e., unlike neural networks, neither feedback nor training is required. The model consists of an energetically conservative field of uniformly distributed events with variable spatial and temporal scale, and an observer walking randomly through this field. A bank of band limited transducers (an 'eye'), each transducer in a bank being tuned to a sub-band, outputs signals upon registering events. Output signals are 'observed' by another transducer bank (a mid-brain), except the band limit of the second bank is narrower than the band limit of the first bank. The banks are arrayed as n 'levels' or 'time domains, td.' The banks are the hierarchical

network (a cortex) and transducers are (associative) memories. A model Neurex was built and studied. Data were 50 MB to 10 GB samples of text, data base, and images: black/white, grey scale, and high resolution in several spectral bands. Memories at td, S(m(sub td)), were plotted against outputs of memories at td-1. S(m(sub td)) was Boltzman distributed, and memory frequencies exhibited self-organized criticality (SOC); i.e., '1/f(sup beta)' after long exposures to data. Whereas output signals from level n may be encoded with B(sub output) = O(-log(2)f(sup beta)) bits, and input data encoded with B(sub input) = O((S(td)/S(td-1))(sup n)), B(sup output)/B(sub input) is much less than 1 always, the Neurex determines a canonical code for data and it is a lossless data compressor. Further tests are underway to confirm these results with more data types and larger samples. Author (revised)

N94-33803*# E-Systems, Inc., Dallas, TX.
VOLUME SERVING AND MEDIA MANAGEMENT IN A NETWORKED, DISTRIBUTED CLIENT/SERVER ENVIRONMENT
Ralph H. Herring and Linda L. Tefend *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 139-148 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

The E-Systems Modular Automated Storage System (EMASS) is a family of hierarchical mass storage systems providing complete storage/'file space' management. The EMASS volume server provides the flexibility to work with different clients (file servers), different platforms, and different archives with a 'mix and match' capability. The EMASS design considers all file management programs as clients of the volume server system. System storage capacities are tailored to customer needs ranging from small data centers to large central libraries serving multiple users simultaneously. All EMASS hardware is commercial off the shelf (COTS), selected to provide the performance and reliability needed in current and future mass storage solutions. All interfaces use standard commercial protocols and networks suitable to service multiple hosts. EMASS is designed to efficiently store and retrieve in excess of 10,000 terabytes of data. Current clients include CRAY's YMP Model E based Data Migration Facility (DMF), IBM's RS/6000 based Unitree, and CONVEX based EMASS File Server software. The VolSer software provides the capability to accept client or graphical user interface (GUI) commands from the operator's console and translate them to the commands needed to control any configured archive. The VolSer system offers advanced features to enhance media handling and particularly media mounting such as: automated media migration, preferred media placement, drive load leveling, registered MediaClass groupings, and drive pooling. Author (revised)

N94-33804*# Maximum Strategy, Inc., Milpitas, CA.
IMPROVEMENT IN HPC PERFORMANCE THROUGH HIPPI RAID STORAGE
Blake Homan *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 149-152 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

In 1986, RAID (redundant array of inexpensive (or independent) disks) technology was introduced as a viable solution to the I/O bottleneck. A number of different RAID levels were defined in 1987 by the Computer Science Division (EECS) University of California, Berkeley, each with specific advantages and disadvantages. With multiple RAID options available, taking advantage of RAID technology required matching particular RAID levels with specific applications. It was not possible to use one RAID device to address all applications. Maximum Strategy's Gen 4 Storage Server addresses this issue with a new capability called programmable RAID level partitioning. This capability enables users to have multiple RAID levels coexist on the same disks, thereby providing the versatility necessary for multiple concurrent applications. Author (revised)

N94-33805*# Ampex Systems Corp., Colorado Springs, CO.
ARCHITECTURAL CONSTRUCTS OF AMPEX DST
Clay Johnson *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 153-161 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

The DST 800 automated library is a high performance, automated tape storage system, developed by AMPEX, providing mass storage to host systems. Physical Volume Manager (PVM) is a volume server which supports either a DST 800, DST 600 stand alone tape drive, or a combination of DST 800 and DST 600 subsystems. The objective of the PVM is to provide the foundation support to allow automated and operator assisted access to the DST cartridges with continuous operation. A second objective is to create a data base about the media, its location, and its usage so that the quality and utilization of the media on which specific data is recorded and the performance of the storage system may be managed. The DST tape drive architecture and media provides several unique functions that enhance the ability to achieve high media space utilization and fast access. Access times are enhanced through the implementation of multiple areas (called system zones) on the media where the media may be unloaded. This reduces positioning time in loading and unloading the cartridge. Access times are also reduced through high speed positioning in excess of 800 megabytes per second. A DST cartridge can be partitioned into fixed size units which can be reclaimed for rewriting without invalidating other recorded data on the tape cartridge. Most tape management systems achieve space reclamation by deleting an entire tape volume, then allowing users to request a 'scratch tape' or 'nonspecific' volume when they wish to record data to tape. Physical cartridge sizes of 25, 75, or 165 gigabytes will make this existing process inefficient or unusable. The DST cartridge partitioning capability provides an efficient mechanism for addressing the tape space utilization problem. Author (revised)

N94-33806*# Boeing Co., Seattle, WA.
VIRTUAL FILE SYSTEM FOR PSDS
Tyson D. Runnels *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 163-168 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

This is a case study. It deals with the use of a 'virtual file system' (VFS) for Boeing's UNIX-based Product Standards Data System (PSDS). One of the objectives of PSDS is to store digital standards documents. The file-storage requirements are that the files must be rapidly accessible, stored for long periods of time - as though they were paper, protected from disaster, and accumulative to about 80 billion characters (80 gigabytes). This volume of data will be approached in the first two years of the project's operation. The approach chosen is to install a hierarchical file migration system using optical disk cartridges. Files are migrated from high-performance media to lower performance optical media based on a least-frequency-used algorithm. The optical media are less expensive per character stored and are removable. Vital statistics about the removable optical disk cartridges are maintained in a database. The assembly of hardware and software acts as a single virtual file system transparent to the PSDS user. The files are copied to 'backup-and-recover' media whose vital statistics are also stored in the database. Seventeen months into operation, PSDS is storing 49 gigabytes. A number of operational and performance problems were overcome. Costs are under control. New and/or alternative uses for the VFS are being considered. Author

N94-33807*# Metrum Information Storage, Hunt Valley, MD.
VOLUME SERVER: A SCALABLE HIGH SPEED AND HIGH CAPACITY MAGNETIC TAPE ARCHIVE ARCHITECTURE WITH CONCURRENT MULTI-HOST ACCESS
Fred Rybczynski *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 169-177 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

A major challenge facing data processing centers today is data management. This includes the storage of large volumes of data and access to it. Current media storage for large data volumes is typically off line and frequently off site in warehouses. Access to data archived in this fashion can be subject to long delays, errors in media selection and retrieval, and even loss of data through misplacement or damage to the media. Similarly, designers responsible for architecting systems capable of continuous high-speed recording of large volumes of digital data are faced with the challenge of identifying technologies and configurations that meet their requirements. Past approaches have tended to evaluate the combination of the fastest tape recorders with the highest capacity tape media and then to compromise technology selection as a consequence of cost. This

paper discusses an architecture that addresses both of these challenges and proposes a cost effective solution based on robots, high speed helical scan tape drives, and large-capacity media. Author

N94-33808*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE GROWTH OF THE UniTree MASS STORAGE SYSTEM AT THE NASA CENTER FOR COMPUTATIONAL SCIENCES

Adina Tarshish and Ellen Salmon *In its* The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 179-185 (For primary document see N94-33791 10-82)

Avail: CASI HC A02/MF A04

In October 1992, the NASA Center for Computational Sciences made its Convex-based UniTree system generally available to users. The ensuing months saw the growth of near-online data from nil to nearly three terabytes, a doubling of the number of CPU's on the facility's Cray YMP (the primary data source for UniTree), and the necessity for an aggressive regimen for repacking sparse tapes and hierarchical 'vaulting' of old files to freestanding tape. Connectivity was enhanced as well with the addition of UltraNet HiPPI. This paper describes the increasing demands placed on the storage system's performance and throughput that resulted from the significant augmentation of compute-server processor power and network speed. Author

N94-33809*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

HIERARCHICAL STORAGE MANAGEMENT SYSTEM EVALUATION

Thomas S. Woodrow *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 187-216 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

The Numerical Aerodynamic Simulation (NAS) Program at NASA Ames Research Center has been developing a hierarchical storage management system, NAStore, for some 6 years. This evaluation compares functionality, performance, reliability, and other factors of NAStore and three commercial alternatives. FileServ is found to be slightly better overall than NAStore and DMF. UniTree is found to be severely lacking in comparison. Author (revised)

N94-33810*# Instrumental, Inc., Minneapolis, MN.

INTRODUCTION OF THE UNIX INTERNATIONAL PERFORMANCE MANAGEMENT WORK GROUP

Henry Newman *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 217-227 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

In this paper we presented the planned direction of the UNIX International Performance Management Work Group. This group consists of concerned system developers and users who have organized to synthesize recommendations for standard UNIX performance management subsystem interfaces and architectures. The purpose of these recommendations is to provide a core set of performance management functions and these functions can be used to build tools by hardware system developers, vertical application software developers, and performance application software developers. Author

N94-33811*# Hughes STX, Inc., Lanham, MD.

PERFORMANCE MEASUREMENTS AND OPERATIONAL CHARACTERISTICS OF THE STORAGE TEK ACS 4400 TAPE LIBRARY WITH THE CRAY Y-MP EL

Gary Hull and Sanjay Ranade *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 229-240 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

With over 5000 units sold, the Storage Tek Automated Cartridge System (ACS) 4400 tape library is currently the most popular large automated tape library. Based on 3480/90 tape technology, the library is used as the migration device ('nearline' storage) in high-performance mass storage systems. In its maximum configuration, one ACS 4400 tape library houses sixteen 3480/3490 tape drives and is capable of holding approximately 6000 cartridge tapes. The maximum storage capacity of one library using 3480 tapes is 1.2 TB and the advertised aggregate I/O rate is about 24 MB/s. This paper reports on an extensive set of tests designed to accurately assess the performance capabilities and operational characteristics of one STK ACS 4400 tape library holding approximately 5200 cartridge tapes and configured with eight 3480 tape drives. A Cray Y-MP EL2-256 was configured as its host machine. More than 40,000 tape jobs were run in a variety of conditions to gather data in the areas of channel speed characteristics, robotics motion, time taped mounts, and timed tape reads and writes. Author (revised)

N94-33812*# Epoch Systems, Westboro, MA.

USING MAGNETIC TAPE TECHNOLOGY FOR DATA MIGRATION

David Therrien and Yim-Ling Cheung *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 241-256 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

Magnetic tape and optical disk library units (jukeboxes) are satisfying the demand for high-capacity cost-effective storage. The choice between optical disk and magnetic tape technology must take into account the cost limitations as well as the performance and reliability requirements of the user environment. Library units require data management software in order to function in an automated and user-transparent way. The most common data management applications are backup and recovery, data migration, and archiving. The medium access patterns that these applications create will be described. Since the most user visible application is data migration, a queue simulator was developed to model its performance against a variety of library units. The major subject of this paper is the design and implementation of this simulator as well as some simulation results. The relative cost and reliability of magnetic tape versus optical disk library units is presented for completeness. Author (revised)

N94-33813*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SIMULATION OF A DATA ARCHIVAL AND DISTRIBUTION SYSTEM AT GSFC

Jean-Jacques Bedet (Hughes STX, Inc., Greenbelt, MD.), Lee Bodden (Hughes STX, Inc., Greenbelt, MD.), Al Dwyer (Hughes STX, Inc., Greenbelt, MD.), P. C. Hariharan (Hughes STX, Inc., Greenbelt, MD.), John Berbert, Ben Kobler, and Phil Pease *In its* The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 257-277 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

A version-0 of a Data Archive and Distribution System (DADS) is being developed at GSFC to support existing and pre-EOS Earth science datasets and test Earth Observing System Data and Information System (EOSDIS) concepts. The performance of DADS is predicted using a discrete event simulation model. The goals of the simulation were to estimate the amount of disk space needed and the time required to fulfill the DADS requirements for ingestion (14 GB/day) and distribution (48 GB/day). The model has demonstrated that 4 mm and 8 mm stackers can play a critical role in improving the performance of the DADS, since it takes, on average, 3 minutes to manually mount/dismount tapes compared to less than a minute with stackers. With two 4 mm stackers and two 8 mm stackers, and a single operator per shift, the DADS requirements can be met within 16 hours using a total of 9 GB of disk space. When the DADS has no stacker, and the DADS depends entirely on operators to handle the distribution tapes, the simulation has shown that the DADS requirements can still be met within 16 hours, but a minimum of 4 operators per shift were required. The compression/decompression of data sets is very CPU intensive, and relatively slow when performed in software, thereby contributing to an increase in the amount of disk space needed. Author (revised)

N94-33814*# Data Storage Technologies, Inc., Ridgewood, NJ.

MASS STORAGE: THE KEY TO SUCCESS IN HIGH PERFORMANCE COMPUTING

Richard R. Lee *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 279-284 (For primary document see N94-33791 10-82)

Avail: CASI HC A02/MF A04

There are numerous High Performance Computing & Communications

Initiatives in the world today. All are determined to help solve some 'Grand Challenges' type of problem, but each appears to be dominated by the pursuit of higher and higher levels of CPU performance and interconnection bandwidth as the approach to success, without any regard to the impact of Mass Storage. My colleagues and I at Data Storage Technologies believe that all will have their performance against their goals ultimately measured by their ability to efficiently store and retrieve the 'deluge of data' created by end-users who will be using these systems to solve Scientific Grand Challenges problems, and that the issue of Mass Storage will become then the determinant of success or failure in achieving each projects goals. In today's world of High Performance Computing and Communications (HPCC), the critical path to success in solving problems can only be traveled by designing and implementing Mass Storage Systems capable of storing and manipulating the truly 'massive' amounts of data associated with solving these challenges. Within my presentation I will explore this critical issue and hypothesize solutions to this problem. Author (revised)

N94-33815*# Advanced Archival Products, Inc., Greenwood Village, CO.
STORAGE SYSTEM ARCHITECTURES AND THEIR CHARACTERISTICS
Bryan M. Sarandrea *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 285-302 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

Not all users storage requirements call for 20 MBS data transfer rates, multi-tier file or data migration schemes, or even automated retrieval of data. The number of available storage solutions reflects the broad range of user requirements. It is foolish to think that any one solution can address the complete range of requirements. For users with simple off-line storage requirements, the cost and complexity of high end solutions would provide no advantage over a more simple solution. The correct answer is to match the requirements of a particular storage need to the various attributes of the available solutions. The goal of this paper is to introduce basic concepts of archiving and storage management in combination with the most common architectures and to provide some insight into how these concepts and architectures address various storage problems. The intent is to provide potential consumers of storage technology with a framework within which to begin the hunt for a solution which meets their particular needs. This paper is not intended to be an exhaustive study or to address all possible solutions or new technologies, but is intended to be a more practical treatment of todays storage system alternatives. Since most commercial storage systems today are built on Open Systems concepts, the majority of these solutions are hosted on the UNIX operating system. For this reason, some of the architectural issues discussed focus around specific UNIX architectural concepts. However, most of the architectures are operating system independent and the conclusions are applicable to such architectures on any operating system. Author (revised)

N94-33816*# ASACA Corp., Hino (Japan).
STORAGE MEDIA PIPELINING: MAKING GOOD USE OF FINE-GRAINED MEDIA
Rodney VanMeter *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 303-311 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

This paper proposes a new high-performance paradigm for accessing removable media such as tapes and especially magneto-optical disks. In high-performance computing the striping of data across multiple devices is a common means of improving data transfer rates. Striping has been used very successfully for fixed magnetic disks improving overall system reliability as well as throughput. It has also been proposed as a solution for providing improved bandwidth for tape and magneto-optical subsystems. However, striping of removable media has shortcomings, particularly in the areas of latency to data and restricted system configurations, and is suitable primarily for very large I/Os. We propose that for fine-grained media, an alternative access method, media pipelining, may be used to provide high bandwidth for large requests while retaining the flexibility to support concurrent small requests and different system configurations. Its principal drawback is high buffering requirements in the host computer or file server. This paper discusses the possible organization of such a system including the hardware conditions under which it may be effective, and the flexibility of configuration. Its expected performance is discussed under varying workloads including large single I/O's and numerous smaller ones. Finally, a specific system incorporating a high-transfer-rate magneto-optical disk drive and autochanger is discussed. Author (revised)

N94-33817*# Department of Defense, Fort Meade, MD.
MASS STORAGE AT NSA
Michael F. Shields *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 325-330 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

The need to manage large amounts of data on robotically controlled devices has been critical to the mission of this Agency for many years. In many respects this Agency has helped pioneer, with their industry counterparts, the development of a number of products long before these systems became commercially available. Numerous attempts have been made to field both robotically controlled tape and optical disk technology and systems to satisfy our tertiary storage needs. Custom developed products were architected, designed, and developed without vendor partners over the past two decades to field workable systems to handle our ever increasing storage requirements. Many of the attendees of this symposium are familiar with some of the older products, such as: the Braegen Automated Tape Libraries (ATL's), the IBM 3850, the Ampex TeraStore, just to name a few. In addition, we embarked on an in-house development of a shared disk input/output support processor to manage our every increasing tape storage needs. For all intents and purposes, this system was a file server by current definitions which used CDC Cyber computers as the control processors. It served us well and was just recently removed from production usage. Author (revised)

N94-33818*# Mobil Oil Corp., Dallas, TX.
ACE: A DISTRIBUTED SYSTEM TO MANAGE LARGE DATA ARCHIVES
Mike I. Daily and Frank W. Allen *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 331-335 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

Competitive pressures in the oil and gas industry are requiring a much tighter integration of technical data into E and P business processes. The development of new systems to accommodate this business need must comprehend the significant numbers of large, complex data objects which the industry generates. The life cycle of the data objects is a four phase progression from data acquisition, to data processing, through data interpretation, and ending finally with data archival. In order to implement a cost effect system which provides an efficient conversion from data to information and allows effective use of this information, an organization must consider the technical data management requirements in all four phases. A set of technical issues which may differ in each phase must be addressed to insure an overall successful development strategy. The technical issues include standardized data formats and media for data acquisition, data management during processing, plus networks, applications software, and GUI's for interpretation of the processed data. Mass storage hardware and software is required to provide cost effective storage and retrieval during the latter three stages as well as long term archival. Mobil Oil Corporation's Exploration and Producing Technical Center (MEPTEC) has addressed the technical and cost issues of designing, building, and implementing an Advanced Computing Environment (ACE) to support the petroleum E and P function, which is critical to the corporation's continued success. Mobile views ACE as a cost effective solution which can give Mobile a competitive edge as well as a viable technical solution.
Author (revised)

N94-33819*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA LANGLEY RESEARCH CENTER'S DISTRIBUTED MASS STORAGE SYSTEM
Juliet Z. Pao and D. Creig Humes *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 337-346 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

There is a trend in institutions with high performance computing and data management requirements to explore mass storage systems with

peripherals directly attached to a high speed network. The Distributed Mass Storage System (DMSS) Project at NASA LaRC is building such a system and expects to put it into production use by the end of 1993. This paper presents the design of the DMSS, some experiences in its development and use, and a performance analysis of its capabilities. The special features of this system are: (1) workstation class file servers running UniTree software; (2) third party I/O; (3) HIPPI network; (4) HIPPI/IPI3 disk array systems; (5) Storage Technology Corporation (STK) ACS 4400 automatic cartridge system; (6) CRAY Research Incorporated (CRI) CRAY Y-MP and CRAY-2 clients; (7) file server redundancy provision; and (8) a transition mechanism from the existent mass storage system to the DMSS. Author (revised)

N94-33820*# Bell Communications Research, Inc., Morristown, NJ.
ATM TECHNOLOGY AND BEYOND
Nim K. Cheung *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 381-387 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

Networks based on Asynchronous Transfer Mode (ATM) are expected to provide cost-effective and ubiquitous infrastructure to support broadband and multimedia services. In this paper, we give an overview of the ATM standards and its associated physical layer transport technologies. We use the experimental HIPPI-ATM-SONET (HAS) interface in the Nectar Gigabit Testbed to illustrate how one can use the SONET/ATM public network to provide transport for bursty gigabit applications. Author

N94-33821*# Maryland Univ. Baltimore County, Catonsville, MD.
ISSUES FOR BRINGING DIGITAL LIBRARIES INTO PUBLIC USE
David W. Flater and Yelena Yesha *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 389-392 (For primary document see N94-33791 10-82)
Avail: CASI HC A01/MF A04

In much the same way that the field of artificial intelligence produced a cult which fervently believed that computers would soon think like human beings, the existence of electronic books has resurrected the paperless society as a utopian vision to some, an apocalyptic horror to others. In this essay we have attempted to provide realistic notions of what digital libraries are likely to become if they are a popular success. E-books are capable of subsuming most of the media we use today and have the potential for added functionality by being interactive. The environmental impact of having millions more computers will be offset to some degree, perhaps even exceeded, by the fact that televisions, stereos, VCR's, CD players, newspapers, magazines, and books will become part of the computer system or be made redundant. On the whole, large-scale use of digital libraries is likely to be a winning proposition. Whether or not this comes to pass depends on the directions taken by today's researchers and software developers. By involving the public, the effort being put into digital libraries can be leveraged into something which is big enough to make a real change for the better. If digital libraries remain the exclusive property of government, universities, and large research firms, then large parts of the world will remain without digital libraries for years to come, just as they have remained without digital phone service for far too long. If software companies try to scuttle the project by patenting crucial algorithms and using proprietary data formats, all of us will suffer. Let us reverse the errors of the past and create a truly open digital library system. Author

N94-33822*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
A DATA DISTRIBUTION STRATEGY FOR THE 1990S (FILES ARE NOT ENOUGH)
Mike Tankenson and Steven Wright *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 393-404 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

Virtually all of the data distribution strategies being contemplated for the EOSDIS era revolve around the use of files. Most, if not all, mass storage technologies are based around the file model. However, files may be the wrong primary abstraction for supporting scientific users in the 1990s and beyond. Other abstractions more closely matching the respective scientific discipline of the end user may be more appropriate. JPL has built a unique multimission data distribution system based on a strategy of telemetry stream emulation to match the responsibilities of spacecraft team and ground data system operators supporting our nations suite of planetary probes. The current system, operational since 1989 and the launch of the Magellan spacecraft, is supporting over 200 users at 15 remote sites. This stream-oriented data distribution model can provide important lessons learned to builders of future data systems. Author

N94-33823*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
ALASKA SAR FACILITY MASS STORAGE, CURRENT SYSTEM
David Cuddy, Eugene Chu, and Tom Bicknell *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 407-415 (For primary document see N94-33791 10-82)
Avail: CASI HC A02/MF A04

This paper examines the mass storage systems that are currently in place at the Alaska SAR Facility (SAF). The architecture of the facility will be presented including specifications of the mass storage media that are currently used and the performances that we have realized from the various media. The distribution formats and media are also discussed. Because the facility is expected to service future sensors, the new requirements and possible solutions to these requirements are also discussed. Author

N94-33824*# Battelle Pacific Northwest Labs., Richland, WA.
VALUE ADDED DATA ARCHIVING
Peter R. Berard *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 417-426 (For primary document see N94-33791 10-82)
(Contracts DE-AC06-76RL-01830; W-7405-eng-48)
Avail: CASI HC A02/MF A04

Researchers in the Molecular Sciences Research Center (MSRC) of Pacific Northwest Laboratory (PNL) currently generate massive amounts of scientific data. The amount of data that will need to be managed by the turn of the century is expected to increase significantly. Automated tools that support the management, maintenance, and sharing of this data are minimal. Researchers typically manage their own data by physically moving datasets to and from long term storage devices and recording a dataset's historical information in a laboratory notebook. Even though it is not the most efficient use of resources, researchers have tolerated the process. The solution to this problem will evolve over the next three years in three phases. PNL plans to add sophistication to existing multilevel file system (MLFS) software by integrating it with an object database management system (ODBMS). The first phase in the evolution is currently underway. A prototype system of limited scale is being used to gather information that will feed into the next two phases. This paper describes the prototype system, identifies the successes and problems/complications experienced to date, and outlines PNL's long term goals and objectives in providing a permanent solution. Author

N94-33825*# Exabyte Corp., Boulder, CO.
A PRACTICAL LARGE SCALE/HIGH SPEED DATA DISTRIBUTION SYSTEM USING 8 mm LIBRARIES
Kevin Howard *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 427-446 (For primary document see N94-33791 10-82)
Avail: CASI HC A03/MF A04

Eight mm tape libraries are known primarily for their small size, large storage capacity, and low cost. However, many applications require an additional attribute which, heretofore, has been lacking -- high transfer rate. Transfer rate is particularly important in a large scale data distribution environment -- an environment in which 8 mm tape should play a very important role. Data distribution is a natural application for 8 mm for several reasons: most large laboratories have access to 8 mm tape drives, 8 mm tapes are upwardly compatible, 8 mm media are very inexpensive, 8 mm media are light weight (important for shipping purposes), and 8 mm media densely pack data (5 gigabytes now and 15 gigabytes on the horizon). If the transfer rate issue were resolved, 8 mm could offer a good solution to the data distribution problem. To that end Exabyte has analyzed four ways to increase its transfer rate: native drive transfer rate increases, data compression at the drive level, tape striping, and homogeneous drive

utilization. Exabyte is actively pursuing native drive transfer rate increases and drive level data compression. However, for non-transmitted bulk data applications (which include data distribution) the other two methods (tape striping and homogeneous drive utilization) hold promise. Author

N94-33826*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DISTRIBUTED ACTIVE ARCHIVE CENTER

Lee Bodden (Hughes STX, Inc., Greenbelt, MD.), Phil Pease, Jean-Jacques Bedet, and Wayne Rosen *In its* The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 447-458 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

The Goddard Space Flight Center Version 0 Distributed Active Archive Center (GSFC V0 DAAC) is being developed to enhance and improve scientific research and productivity by consolidating access to remote sensor earth science data in the pre-EOS time frame. In cooperation with scientists from the science labs at GSFC, other NASA facilities, universities, and other government agencies, the DAAC will support data acquisition, validation, archive and distribution. The DAAC is being developed in response to EOSDIS Project Functional Requirements as well as from requirements originating from individual science projects such as SeaWiFS, Meteor3/TOMS2, AVHRR Pathfinder, TOVS Pathfinder, and UARS. The GSFC V0 DAAC has begun operational support for the AVHRR Pathfinder (as of April, 1993), TOVS Pathfinder (as of July, 1993) and the UARS (September, 1993) Projects, and is preparing to provide operational support for SeaWiFS (August, 1994) data. The GSFC V0 DAAC has also incorporated the existing data, services, and functionality of the DAAC/Climate, DAAC/Land, and the Coastal Zone Color Scanner (CZCS) Systems. Author

N94-33827*# Oak Ridge National Lab., TN. Environmental Sciences Div.

USER INTERFACE DEVELOPMENT AND METADATA CONSIDERATIONS FOR THE ATMOSPHERIC RADIATION MEASUREMENT (ARM) ARCHIVE

P. T. Singley, J. D. Bell, P. F. Daugherty, C. A. Hubbs, and J. G. Tuggle *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 459-468 (For primary document see N94-33791 10-82)

(Contract DE-AC05-84OR-21400)

Avail: CASI HC A02/MF A04

This paper will discuss user interface development and the structure and use of metadata for the Atmospheric Radiation Measurement (ARM) Archive. The ARM Archive, located at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, is the data repository for the U.S. Department of Energy's (DOE's) ARM Project. After a short description of the ARM Project and the ARM Archive's role, we will consider the philosophy and goals, constraints, and prototype implementation of the user interface for the archive. We will also describe the metadata that are stored at the archive and support the user interface. Author

N94-33828*# Minnesota Univ., Minneapolis, MN. Dept. of Computer Science.

A PARALLEL DATA MANAGEMENT SYSTEM FOR LARGE-SCALE NASA DATASETS

Jaideep Srivastava *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 469-485 (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

The past decade has experienced a phenomenal growth in the amount of data and resultant information generated by NASA's operations and research projects. A key application is the reprocessing problem which has been identified to require data management capabilities beyond those available today (PRAT93). The Intelligent Information Fusion (IIF) system (ROEL91) is an ongoing NASA project which has similar requirements. Deriving our understanding of NASA's future data management needs based on the above, this paper describes an approach to using parallel computer systems (processor and I/O architectures) to develop an efficient parallel database management system to address the needs. Specifically, we propose to investigate issues in low-level record organizations and management, complex query processing, and query compilation and scheduling. Author

N94-33829*# Manchester Univ. (England). Dept. of Electrical Engineering.

THE IMPORTANCE OF ROBUST ERROR CONTROL IN DATA COMPRESSION APPLICATIONS

S. I. Woolley *In* NASA. Goddard Space Flight Center, The Third NASA Goddard Conference on Mass Storage Systems and Technologies Apr. 1993 p 487-502 Sponsored by British Gas Corp. (For primary document see N94-33791 10-82)

Avail: CASI HC A03/MF A04

Data compression has become an increasingly popular option as advances in information technology have placed further demands on data storage capabilities. With compression ratios as high as 100:1 the benefits are clear; however, the inherent intolerance of many compression formats to error events should be given careful consideration. If we consider that efficiently compressed data will ideally contain no redundancy, then the introduction of a channel error must result in a change of understanding from that of the original source. While the prefix property of codes such as Huffman enables resynchronisation, this is not sufficient to arrest propagating errors in an adaptive environment. Arithmetic, Lempel-Ziv, discrete cosine transform (DCT) and fractal methods are similarly prone to error propagating behaviors. It is, therefore, essential that compression implementations provide sufficient combatant error control in order to maintain data integrity. Ideally, this control should be derived from a full understanding of the prevailing error mechanisms and their interaction with both the system configuration and the compression schemes in use. Author

N94-33871# Japan Atomic Energy Research Inst., Tokyo (Japan).

DEVELOPMENT OF A VME AND CAMAC BASED DATA ACQUISITION AND TRANSFER SYSTEM FOR JT-60 CONTROL

Toshiyuki Totsuka Aug. 1993 42 p

(DE94-727590; JAERI-M-93-158) Avail: CASI HC A03/MF A01

Development of a VME and CAMAC based data acquisition and transfer system for JT-60 control is reported. The present data acquisition and transfer system in JT-60 control is basically composed of CAMAC devices. Since the system equipped with 16-bit microcomputers was manufactured more than ten years ago, the performance and program development environment of the system are apparently worse than those of modern 32-bit microcomputers. To improve these disadvantages, a new data acquisition and transfer system using VME-based 32-bit microcomputers and CAMAC drivers is under design. Corresponding to this design, a CAMAC handler, which runs on the microcomputer, for the VME based CAMAC driver was developed. Moreover, the functions of the driver and data transfer performance of the VME and CAMAC complex system were tested. The test results show that the VME based microcomputer and CAMAC serial driver can be applied for the fast and reliable acquisition and transfer system for JT-60 control. DOE

N94-33909# Los Alamos National Lab., NM.

A SYSTEMS ENGINEERING APPROACH TO AIS ACCREDITATION

L. M. Harris and W. J. Hunteman 1994 12 p Presented at the 16th DOE Computer Security Group Training Conference, Denver, CO, 3-5 May 1994

(Contract W-7405-eng-36)

(DE94-009354; LA-UR-94-911; CONF-9405111-2) Avail: CASI HC A03/MF A01

The systems engineering model provides the vehicle for communication between the developer and the customer by presenting system facts and demonstrating the system in an organized form. The same model provides implementors with views of the system's function and capability. The authors contend that the process of obtaining accreditation for a classified automated information system (AIS) adheres to the typical systems engineering model. The accreditation process is modeled as a 'roadmap' with the customer represented by the designed accrediting authority. The 'roadmap' model reduces the amount of accreditation knowledge required of an AIS developer and maximizes the effectiveness of participation in the accreditation process by making the understanding of accreditation a natural consequence of applying the model. This paper identifies ten 'destinations' on the 'road' to accreditation. The significance of each 'destination' is explained, as are

the potential consequences of its exclusion. The 'roadmap,' which has been applied to a range of information systems throughout the DOE community, establishes a paradigm for the certification and accreditation of classified AIS's. DOE

N94-34003# Logistics Management Inst., Bethesda, MD.
ELECTRONIC DATA INTERCHANGE READING MATERIAL: AN ANNOTATED BIBLIOGRAPHY REPORT Report, Jul. 1985 - Dec. 1993
Ann P. Lewis Feb. 1994 54 p
(Contract MDA903-90-C-0006)
(AD-A278345; LMI-DL203LN28) Avail: CASI HC A04/MF A01

This annotated bibliography of technical reports deals with electronic data interchange (EDI) used in a wide range of Department of Defense applications. The information covers an 8-year time frame from July 1985 through December 1993. We list 91 citations in chronological order categorized in the following functional areas: management and planning, software, telecommunications, standards/guidelines, security, transportation, procurement/contract management, finance, and supply/maintenance. Topics include discussions of advantages and problems encountered, standards aspects, implementation convention development, security management, component contracting activities, and other disciplines. Also included are title and author indexes for quicker reference. DTIC

N94-34013# Sandia National Labs., Albuquerque, NM.
SAFEGUARDS INFORMATION MANAGEMENT SYSTEMS (SIMS)
R. J. Sorenson (Department of Energy, Washington, DC.), K. B. Sheely (Department of Energy, Washington, DC.), J. B. Brown (Pacific Northwest Environmental Research Lab., Corvallis, OR.), R. D. Horton, R. Strittmatter, and D. R. Manatt 1994 10 p Presented at the International Symposium on Nuclear Material Safeguards, Vienna, Austria, 14-18 Mar. 1994
(Contract DE-AC04-94AL-85000)
(DE94-008936; SAND-94-0714C; CONF-940307-24) Avail: CASI HC A02/MF A01

The requirements for the management of information at the International Atomic Energy Agency (IAEA) and its Department of Safeguards are rapidly changing. Historically, the Department of Safeguards has had the requirement to process large volumes of conventional safeguards information. An information management system is currently in place that adequately handles the IAEA's conventional safeguards data needs. In the post-Iraq environment, however, there is a growing need to expand the IAEA information management capability to include unconventional forms of information. These data include environmental sampling results, photographs, video film, lists of machine tools, and open-source materials such as unclassified publications. The US Department of Energy (DOE) has responded to this information management need by implementing the Safeguards Information Management Systems (SIMS) initiative. SIMS was created by the DOE to anticipate and respond to IAEA information management needs through a multilaboratory initiative that will utilize an integrated approach to develop and deploy technology in a timely and cost-effective manner. The DOE will use the SIMS initiative to coordinate US information management activities that support the IAEA Department of Safeguards. DOE

N94-34090# Los Alamos National Lab., NM.
SCIENTIFIC DATA STORAGE SOLUTIONS: MEETING THE HIGH-PERFORMANCE CHALLENGE
D. Krantz, L. Jones, L. Kluegel, C. Ramsey, and W. Collins 1994 11 p Presented at the Cray User's Meeting, San Diego, CA, 14-18 Mar. 1994
(Contract W-7405-eng-36)
(DE94-009312; LA-UR-94-876; CONF-940392-1) Avail: CASI HC A03/MF A01

The Los Alamos High-Performance Data System (HPDS) has been developed to meet data storage and data access requirements of Grand Challenge and National Security problems running in a high-performance computing environment. HPDS is a fourth-generation data storage system in which storage devices are directly connected to a network, data is transferred directly between client machines and storage devices, and software distributed on workstations provides system management and control capabilities. Essential to the success of HPDS is the ability to effectively use HIPPI networks and HIPPI-attached storage devices for high-speed data transfer. This paper focuses on the performance of the HPDS storage systems in a Cray Supercomputer environment. DOE

N94-34161 National Defence Research Establishment, Umea (Sweden). Huvudadelning foer ABC-Skydd.
TILDA FOR WINDOWS: A SYSTEM FOR REGISTRATION OF JOURNALS IN THE LIBRARY AT NDRE NBC-DEFENCE [TILDA FOER WINDOWS: ETT SYSTEM FOER REGISTRERING AV TIDSKRIFTER VID BIBLIOTEKET, FOA ABC-SKYDD]
C. Persson, S. Westman, and K. Robertsdotter Oct. 1993 42 p In SWEDISH
(PB94-149168; FOA-C-40312-4.9) Avail: Issuing Activity (National Technical Information Service (NTIS))

The library at the National Defense Research Establishment (NDRE) subscribes to about 200 journals. Information about them (title, price, deliveries, etc.) is stored in a VaxNMS database system which has been working well, but printing out a report has required a great deal of work. A new system has been made for the PC-environment with MS Windows. The user interface follows the Windows standard. The development has been done on the target system with object oriented methods. The major tools were Borland C++ 3.1, Paradox, Paradox Engine, and Crystal Report. NTIS

N94-34173*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SPACE SCIENCES LABORATORY PUBLICATIONS AND PRESENTATIONS, 1 JANUARY - 31 DECEMBER, 1993
T. W. Moorehead Apr. 1994 81 p
(NASA-TM-108450; NAS 1.15:108450) Avail: CASI HC A05/MF A01

This document lists the significant publications and presentations of the Space Sciences Laboratory during the period January 1 to December 31, 1993. Entries in the main part of the document are categorized according to NASA Reports (arranged by report number), Open Literature, and Presentations (arranged alphabetically by title). Also included for completeness is an Appendix (arranged by report number) listing preprints issued by the Laboratory during this reporting period. Some of the preprints have not been published; those already published are so indicated. Most of the articles listed under Open Literature have appeared in refereed professional journals, books, monographs, or conference proceedings. Although many published abstracts are eventually expanded into full papers for publications in scientific and technical journals, they are often sufficiently comprehensive to include the significant results of the research reported. Therefore, published abstracts are listed separately in a subsection under Open Literature. The organizational code of the cognizant SSL branch or office is given at the end of each entry. Author

N94-34213 Defense Technical Information Center, Alexandria, VA.
DTIC THESAURUS ON DISKETTE WITH dBASE 4.1 RUNTIME (COMPUTER DISKETTE)
1993 1 p See also AD-A268855, AD-M000310, AD-M000309, AD-M000312, and AD-M000306
(AD-M000311; NONP-DTIC-DK-94-2364) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The DTIC Thesaurus provides a basic multidisciplinary subject term vocabulary used by DTIC to index and retrieve scientific and technical information from its various databases and to aid DTIC's users in their information storage and retrieval operations. System capabilities of the diskette version include: posting term, user reference, and hierarchy search and display; posting term search by any word within the full term (KWOC listing); posting term and use reference search by truncated entry of the beginning characters of the first word(s) of the term; two drill-down expansions within thesaurus displays; and meaningful 'not found' messages displayed and retained on search screens. DTIC

N94-34377# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.
A FORMAT FOR STORING AND MANAGING MULTIPLE LEVEL OF DETAIL TERRAIN FOR SIMULATED ENVIRONMENTS M.S. Thesis
Keith L. Meissner Mar. 1994 115 p
(AD-A278497; AFIT/GCS/ENG/94M-01) Avail: CASI HC A06/MF A02

This study investigated a method of storing, managing, and rendering terrain data, while addressing the following conflicting goals: rendering speed, display detail, and memory usage. A data structure is presented to store terrain data, with an object oriented system to manage the data stored in the structure. The structure stores terrain data in a compact form, which is

converted into rendering structures in real time. The structure uses levels of detail to maintain display detail. The structure is compared against an existing format for storing terrain data, MultiGen Flight. The system managing the structure is shown to decrease memory usage and increase frame rate, while maintaining display detail. The structure offers features not attainable from Flight format, including: interpolating vertices to prevent cracking, defining levels of detail by altitude and speed, and betweening. The structure allows storing and rendering larger databases than previously manageable with Flight format. DTIC

N94-34603*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 35: THE US GOVERNMENT TECHNICAL REPORT AND AEROSPACE KNOWLEDGE DIFFUSION: RESULTS OF AN ON-GOING INVESTIGATION

Thomas E. Pinelli, A. Rahman Khan, Rebecca O. Barclay, and John M. Kennedy 1993 23 p Presented at GL 1993: the First International Conference on Grey Literature, Amsterdam, Netherlands, 13-15 Dec. 1993
(NASA-TM-109861; NAS 1.15:109861) Avail: CASI HC A03/MF A01

The U.S. government technical report is a primary means by which the results of federally funded research and development (R&D) are transferred to the U.S. aerospace industry. However, little is known about this information product in terms of its actual use, importance, and value in the transfer of federally funded (U.S.) R&D. To help establish a body of knowledge, the U.S. government technical report is being investigated as part of the NASA/DOD Aerospace Knowledge Diffusion Research Project. In this paper, we summarize the literature on technical reports and provide a model that depicts the transfer of federally funded aerospace R&D via the U.S. government technical report. We present results from two surveys (one of five studies) of our investigation of aerospace knowledge diffusion vis-a-vis the U.S. government technical report and close with a brief overview of on-going research into the use of the U.S. government technical report as a rhetorical device for transferring federally funded aerospace R&D.
Author (revised)

N94-34604*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 41: TECHNICAL COMMUNICATION PRACTICES OF DUTCH AND US AEROSPACE ENGINEERS AND SCIENTISTS: INTERNATIONAL PERSPECTIVE ON AEROSPACE

Rebecca O. Barclay (Rensselaer Polytechnic Inst., Troy, NY.), Thomas E. Pinelli, and John M. Kennedy 1994 12 p Repr. from IEEE Transactions on Professional Communication, v. 37, no. 2, Jun. 1994 p 97-107
(ISSN 0361-1434)
(NASA-TM-109862; NAS 1.15:109862) Copyright Avail: CASI HC A03/MF A01

As part of Phase 4 of the NASA/DOD Aerospace Knowledge Diffusion Research Project, studies were conducted that investigated the technical communications practices of Dutch and U.S. aerospace engineers and scientists. The studies had the following objectives: (1) to solicit the opinions of aerospace engineers and scientists regarding the importance of technical communication to their professions, (2) to determine the use and production of technical communication by aerospace engineers and scientists, (3) to investigate their use of libraries and technical information centers, (4) to investigate their use of and the importance to them of computer and information technology, (5) to examine their use of electronic networks, and (6) to determine their use of foreign and domestically produced technical reports. Self-administered (mail) questionnaires were distributed to Dutch aerospace engineers and scientists at the National Aerospace Laboratory (NLR) in the Netherlands, the NASA Ames Research Center in the U.S., and the NASA Langley Research Center in the U.S. Responses of the Dutch and U.S. participants to selected questions are presented in this paper. Author

N94-34730*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 42: AN ANALYSIS OF THE TRANSFER OF SCIENTIFIC AND TECHNICAL INFORMATION (STI) IN THE US AEROSPACE INDUSTRY

John M. Kennedy (Indiana Univ., Bloomington, IN.), Thomas E. Pinelli, Laura F. Hecht, and Rebecca O. Barclay 1994 17 p Presented at the Annual Meeting of the American Sociological Association, Los Angeles, CA, 5-9 Aug. 1994
(Grant NAGw-1682)
(NASA-TM-109863; NAS 1.15:109863) Avail: CASI HC A03/MF A01

The U.S. aerospace industry has a long history of federal support for research related to its needs. Since the establishment of the National Advisory Committee for Aeronautics (NACA) in 1915, the federal government has provided continuous research support related to flight and aircraft design. This research has contributed to the international preeminence of the U.S. aerospace industry. In this paper, we present a sociological analysis of aerospace engineers and scientists and how their attitudes and behaviors impact the flow of scientific and technical information (STI). We use a constructivist framework to explain the spotty dissemination of federally funded aerospace research. Our research is aimed towards providing federal policymakers with a clearer understanding of how and when federally funded aerospace research is used. This understanding will help policymakers design improved information transfer systems that will aid the competitiveness of the U.S. aerospace industry. Author (revised)

N94-33614*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.

USING TASK ANALYSIS TO UNDERSTAND THE DATA SYSTEM OPERATIONS TEAM

Barbara E. Holder *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 337-344 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

N94-34041*# Stanford Univ., Palo Alto, CA. Knowledge Systems Lab.

THE STANFORD HOW THINGS WORK PROJECT

Richard Fikes, Tom Gruber, and Yumi Iwasaki *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 167-176 Sponsored by DARPA (For primary document see N94-34019 10-99)
(Contract NAG2-581; NCC2-537)
Avail: CASI HC A02/MF A04

N94-34042*# Teleos Research, Palo Alto, CA.

ACTING TO GAIN INFORMATION: REAL-TIME REASONING MEETS REAL-TIME PERCEPTION Abstract Only

Stan Rosenschein *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 177 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34049*# Maryland Univ., College Park, MD. Dept. of Computer Science.

HYBRID KNOWLEDGE SYSTEMS

V. S. Subrahmanian *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 218-225 (For primary document see N94-34019 10-99)
(Contracts F49620-93-1-0065; DAAL03-92-G-0225)
Avail: CASI HC A02/MF A04

N94-34050*# University of Southern California, Marina del Rey, CA. Dept. of Computer Science.

TWO FRAMEWORKS FOR INTEGRATING KNOWLEDGE IN INDUCTION

Paul S. Rosenbloom, Haym Hirsh, William W. Cohen, and Benjamin D. Smith *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 226-233 (For primary document see N94-34019 10-99)
(Contract NCC2-538)
Avail: CASI HC A02/MF A04

N94-34056*# Texas Univ., Austin, TX. Dept. of Computer Science.

AUTOMATED KNOWLEDGE-BASE REFINEMENT

Raymond J. Mooney *In* NASA. Johnson Space Center, The Seventh

Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 276-283 (For primary document see N94-34019 10-99)
(Contract NCC2-629; NSF IRI-91-02926; TARP-003658114)
Avail: CASI HC A02/MF A04

N94-34057*# Texas Univ., Austin, TX. Dept. of Computer Science.
IMPROVING THE EXPLANATION CAPABILITIES OF ADVISORY SYSTEMS
Bruce Porter and Art Souther *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 284-300 (For primary document see N94-34019 10-99)
(Contract F49620-93-1-0239; NSF IRI-91-20310)
Avail: CASI HC A03/MF A04

N94-34058*# Illinois Univ., Urbana, IL.
RECURSIVE HEURISTIC CLASSIFICATION Abstract Only
David C. Wilkins *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 301 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

N94-34061*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ENGINEERING DESIGN KNOWLEDGE RECYCLING IN NEAR-REAL-TIME
Larry Leifer (Stanford Univ., CA.), Vinod Baya (Stanford Univ., CA.), George Toye (Stanford Univ., CA.), Catherine Baudin, and Jody Gevins Underwood *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 313-320 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

N94-35044*# International Business Machines Corp., Yorktown Heights, NY.
INTERACTIVE ARCHIVES OF SCIENTIFIC DATA
Lloyd A. Treinish *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 3-15 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

N94-35045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PLANNING APPLICATIONS IN IMAGE ANALYSIS
Mark Boddy (Honeywell, Inc., Minneapolis, MN.), Jim White (Honeywell, Inc., Minneapolis, MN.), Robert Goldman (Honeywell, Inc., Minneapolis, MN.), and Nick Short, Jr. *In its* The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 17-28 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

N94-35046*# Lockheed Missiles and Space Co., Palo Alto, CA.
RAVE: RAPID VISUALIZATION ENVIRONMENT
D. M. Klumpar, Kevin Anderson, and Avangelos Simoudis *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 29-38 (For primary document see N94-35043 10-63)
Avail: CASI HC A02/MF A03

N94-35056*# Massachusetts Univ., Amherst, MA. Computer Science Dept.
AUTOMATED ANALYSIS OF COMPLEX DATA
Robert SaintAmant and Paul R. Cohen *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 161-171 (For primary document see N94-35043 10-63)
(Contracts F30602-91-C-0076; F30602-93-C-0100)
Avail: CASI HC A03/MF A03

N94-35057*# Caelum Research Corp., Silver Spring, MD.
AN ADAPTIVE TECHNIQUE TO MAXIMIZE LOSSLESS IMAGE DATA COMPRESSION OF SATELLITE IMAGES
Robert J. Stewart, Y. M. Fleming Lure, and C. S. Joe Liou *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 173-182 (For primary document see N94-35043 10-63)
Avail: CASI HC A02/MF A03

N94-35067*# University of Southern California, Marina del Rey, CA. Information Sciences Inst.
TELECOMMUNICATIONS ISSUES OF INTELLIGENT DATABASE MANAGEMENT FOR GROUND PROCESSING SYSTEMS IN THE EOS ERA
Joseph D. Touch *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 295-303 (For primary document see N94-35043 10-63)
(Contract DABT63-91-C-0001)
Avail: CASI HC A02/MF A03

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see also *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N94-33569* National Aeronautics and Space Administration, Washington, DC.
REFOCUSING SPACE TECHNOLOGY (Videotape)
May 1994 Videotape: 7 min. 25 sec. playing time, in color, with sound (NASA-TM-109833; NONP-VT-94-12961) Avail: CASI VHS A01/BETA A22

This video presents two examples of NASA Technology Transfer. The first is a Downhole Video Logger, which uses remote sensing technology to help in mining. The second example is the use of satellite image processing technology to enhance ultrasound images taken during pregnancy. CASI

N94-33733# Pacific Northwest Lab., Richland, WA.
ECONOMIC ESPIONAGE AND INFORMATION SECURITY
D. R. Miles Oct. 1993 11 p Presented at the ASIS Security Seminar, Richland, WA, 22-23 Oct. 1993
(Contract DE-AC06-76RL-01830)

(DE94-003692; PNL-SA-23158; CONF-9310245-1) Avail: CASI HC A03/MF A01 (US Sales Only)

This report presents information on case studies and comments regarding commercial and economic collections; adversary efforts; concern for the loss of technology; R&D and the transfer of technology; target attractiveness; and future concerns relating to information security. DOE

88 SPACE SCIENCES (GENERAL)

N94-34212*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

GAS-GRAIN SIMULATION FACILITY: AEROSOL AND PARTICLE RESEARCH IN MICROGRAVITY

Judith L. Huntington, ed., Ken Greenwald, ed., C. Fred Rogers, ed., David M. Stratton, ed., Brenda Simmons, ed., and Mark L. Fonda, ed. Feb. 1994 127 p Presented at the GGSF Science Workshop, Las Vegas, NV, 4-6 May 1992; sponsored by Desert Research Inst. and Nevada Univ. System

(RTOP 106-60-00)

(NASA-CP-10135; A-94035; NAS 1.55:10135) Avail: CASI HC A07/MF A02

This document reports on the proceedings of the Gas-Grain Simulation Facility (GGSF) Science Workshop which was co-hosted by NASA Ames Research Center and Desert Research Institute, University of Nevada System, and held in Las Vegas, Nevada, on May 4-6, 1992. The intent of the workshop was to bring together the science community of potential GGSF experimenters, Science Working Group and staff members, and the Phase A contractor to review the Phase A design with the science participants and to facilitate communication between the science community and the hardware developers. The purpose of this report is to document the information disseminated at the workshop, to record the participants' review of the Phase A GGSF design concept and the current science and technical requirements for the Facility, and to respond to any questions or concerns that were raised at the Workshop. Recommendations for the future based on numerous discussions with the participants are documented, as well as science presentations and poster sessions that were given at the Workshop and a summary of 21 candidate experiments. Author

89 ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

N94-33695 Fermi National Accelerator Lab., Batavia, IL.

DATA ACQUISITION SYSTEMS FOR THE SLOAN DIGITAL SKY SURVEY

D. Petravick, E. Berman, B. MacKinnon, T. Nicinski, R. Pordes, G. Sergey, R. Rechenmacher, J. Annis, S. Kent, and T. McKay et al Mar. 1994 14 p Presented at the Society of Photo-Optical Instrumentation Engineers Conference, Kona Beach, HI, 13-18 Mar. 1994 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract DE-AC02-76CH-03000)

(DE94-008992; FNAL/C-94/064; CONF-940391-1) Avail: CASI HC A03

The Sloan Digital Sky Survey (SDSS) will image Pi steradians about the north galactic cap in five filters and acquire one million spectra using a dedicated 2.5 meter telescope at the Apache Point Observatory in New Mexico. The authors describe the data acquisition system for the survey's three main detectors: an imaging camera, mounting 54 Tektronix charge-coupled devices (CCD); a pair of spectrographs, each mounting a pair of CCD's; and a smaller monitor telescope camera. The authors describe the system's hardware and software architecture and relate it to the survey's special requirements for high reliability and need to understand its instrumentation in order to produce a consistent survey over a five year period. DOE

N94-33904*# Computer Sciences Corp., Calverton, MD. System Sciences Div.

UV SPECTROSCOPY OF LOW-REDSHIFT ACTIVE GALAXIES Final Report

C.-C. Wu and M. Crenshaw 21 Jun. 1993 3 p

(Contract NAS5-32080)

(NASA-CR-189323; NAS 1.26:189323; RHPF711) Avail: CASI HC A01/MF A01

Ultraviolet spectra of bright Seyfert 1 galaxies will be obtained with the Hubble Space Telescope. Observations will be used to pursue the following goals: (1) Broad and narrow components of the strong emission lines will be deconvolved. (2) Broad-line profiles will be extracted for comparison with kinematic models; line ratios will be determined. (3) Many weak UV and emission lines from optical spectra will be compared for reddening along line of sight and chemical composition. (4) Absorption lines from Galactic halo, intergalactic medium and Seyfert galaxy will be used to establish physical conditions/chemical composition of the gas. (5) Strong emission Fe II in the UV will be used to determine FE II/L-alpha ratios for comparison with photoionization models. Other tasks relating to GTO 1170 program will be performed. It appears that NLR clouds in NGC 5548 experience much higher level of ionizing flux than those Seyfert 2 galaxies. Future observations will determine if this result extends to other Seyfert 1 galaxies. Author

N94-33993*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

ASTRONOMICAL CATALOG DESK REFERENCE, 1994 EDITION

Jan. 1994 267 p

(NASA-TM-109781; NAS 1.15:109781; NSSDC/WDC-A-R/S-93-38) Avail: CASI HC A12/MF A03

The Astronomical Catalog Desk Reference is designed to aid astronomers in locating machine readable catalogs in the Astronomical Data Center (ADC) archives. The key reference components of this document are as follows: A listing of shortened titles for all catalogs available from the ADC (includes the name of the lead author and year of publication), brief descriptions of over 300 astronomical catalogs, an index of ADC catalog numbers by subject keyword, and an index of ADC catalog numbers by author. The heart of this document is the set of brief descriptions generated by the ADC staff. The 1994 edition of the Astronomical Catalog Desk Reference contains descriptions for over one third of the catalogs in the ADC archives. Readers are encouraged to refer to this section for concise summaries of those catalogs and their contents. Derived from text

N94-34119*# Lockheed Aircraft Corp., Palo Alto, CA. Research Lab.

A STUDY OF LOW MASS X-RAY BINARIES Final Report, 1 Jul. 1991 - 31 Mar. 1994

Richard C. Catura 31 Mar. 1994 72 p

(Contract NAS5-31056)

(NASA-CR-195813; NAS 1.26:195813) Avail: CASI HC A04/MF A01

The entire effort under this contract during the period through January 1992 was devoted to a study of the cost and schedule required to put an upgraded Aries payload on the ASTRO-SPAS carrier provided by the German space agency, DARA. The ASTRO-SPAS is flown on the Space Shuttle, deployed by the crew for 5 to 7 days of free-flying observations and then recovered and returned to Earth. The spectrograph was to be provided by a collaboration involving the Lockheed Palo Alto Research Laboratory (LPARL), the Center for Astrophysics and Space Astronomy (CASA) at the U. of Colorado and the Mullard Space Science Laboratory (MSSL) in England. The payload for the ASTRO-SPAS mission included our own spectrograph and an instrument provided by Dr. Joachim Trumper of the Max Planck Institute (MPI) in Garching, Germany. A meeting was held in late July, 1991 with German scientists, DARA representatives and MBB, the ASTRO-SPAS spacecraft contractor. Sufficient information was exchanged to allow us to complete the study and the name LEXSA (Low Energy X-ray Spectrograph on ASTRO-SPAS) was given to our instrument and HERTA (High Energy x-Ray Telescope on ASTR0-SPAS) to the German instrument. The combination was called SPECTRO-SPAS. On October 1, 1991 CASA and LPARL submitted a cost and brief technical proposal to NASA on results of the study. The total cost over 4 fiscal years was 6.16 M dollars including CASA costs. NASA Headquarters was briefed on 3 October on details of the proposal. They found our costs reasonable, but

indicated that the NASA FY '92 budget is extremely tight, they could not readily identify where the -S2.3M for LEXSA could be found and it was not clear that FY '93 would improve. Derived from text

N94-34267*# Applied Research Corp., Landover, MD.
IUE OBSERVATIONS OF NEW A STAR CANDIDATE PROTO-PLANETARY SYSTEMS Final Report, May 1993 - May 1994
Carol A. Grady 2 Jun. 1994 27 p
(NASA Order S-14605-F)
(NASA-CR-195905; NAS 1.26:195905; R94-219) Avail: CASI HC A03/MF A01

As a result of the detection of accreting gas in the A5e PMS Herbig Ae star, HR 5999, most of the observations for this IUE program were devoted to Herbig Ae stars rather than to main sequence A stars. Mid-UV emission at optical minimum light was detected for UX Ori (A1e), BF Ori (A5e), and CQ Tau (F2e). The presence of accreting gas in HD 45677 and HD 50138 prompted reclassification of these stars as Herbig Be stars rather than as protoplanetary nebulae. Detailed results are discussed.
Author (revised)

N94-34379# Onsala Space Observatory (Sweden).
ARE THERE TWO ENGINES AT THE CENTER OF 3C286?
F. J. Zhang (Shanghai Observatory, China.), R. E. Spencer (Nuffield Radio Astronomy Labs., Jodrell Bank, England.), R. T. Schilizzi (Netherlands Foundation for Radio Astronomy, Dwingelo.), C. Fanti (Istituto di Radioastronomia, Bologna, Italy.), and L. B. Baath Dec. 1993 9 p
(PB94-149218; Rept-93/118) Avail: CASI HC A02/MF A01

This paper presents images of the compact steep-spectrum quasar 3C286 obtained with global VLBI arrays at 4.99 and 1.66 GHz. The morphology appears to be intermediate between the core-jet types and grossly distorted objects. The central portion is resolved into two components of almost equal peak brightnesses and spectral indices. NTIS

N94-34705*# California Univ., Berkeley, CA. Space Sciences Lab.
AIRBORNE ASTRONOMY WITH A 150 MICROMETER - 500 MICROMETER HETERODYNE SPECTROMETER Final Report, 1 Oct. 1983 - 30 Sep. 1991
A. L. Betz 1991 129 p
(Grant NAG2-254)
(NASA-CR-195940; NAS 1.26:195940) Copyright Avail: CASI HC A07/MF A02

This report summarizes work done under NASA Grant NAG2-254 awarded to the University of California. The project goal was to build a far-infrared heterodyne spectrometer for NASA's Kuiper Airborne Observatory (KAO), and to use this instrument to observe atomic and molecular spectral lines from the interstellar medium. This goal was successfully achieved; the spectrometer is now in routine use aboard the KAO. Detections of particular note have been the 370 micrometers line of neutral atomic carbon, the 158 micrometers transition of ionized carbon, many of the high-J rotational lines of 12CO and 13CO between J=9-8 and J=22-21, the 119 micron ground-state rotational line of OH, and the 219 micron ground-state rotational line of H2D(+). All of these lines were observed at spectral resolutions exceeding 1 part in 10(exp 6), thereby allowing accurate line shapes and Doppler velocities to be measured. Author

N94-34718*# California Inst. of Tech., Pasadena, CA. Div. of Geological and Planetary Sciences.
DETECTION OF THE 267 GHz J = 1-0 ROTATIONAL TRANSITION OF PH3 IN SATURN WITH A NEW FOURIER TRANSFORM SPECTROMETER
Eric W. Weisstein and E. Serabyn 13 Apr. 1994 27 p Submitted for publication
(Grants NAGw-3303; NAGw-1448; NSF AST-93-13929)
(NASA-CR-194364; NAS 1.26:194364) Avail: CASI HC A03/MF A01

In recent observations at the Caltech Submillimeter Observatory, the highly pressure-broadened (FWHM = 11.2 GHz) J = 1-0 rotational transition of PH3 (phosphine) was detected on Saturn. By modeling the Saturnian atmosphere with a radiative transfer code, the observed line profile was consistent with a constant PH3 mole fraction of 3.0 plus or minus 1.0 ppm in the upper troposphere. A best-fit to the depth of the line implies a cutoff at high altitudes, with no PH3 present at pressures approximately less than 100 mbar. The observed line depth, combined with the lack of a detectable emission core, implies that a cutoff in the PH3 abundance occurs at a pressure between 13 and 140 mbar. PH3 in Jupiter was not detected, nor any other molecular lines between 195 and 295 GHz (1.54 mm and 1.02 mm, respectively) in either Jupiter or Saturn.
Author (revised)

N94-34920*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
LUNAR ULTRAVIOLET TELESCOPE EXPERIMENT (LUTE), PHASE A Final Report
Robert O. McBrayer Washington Apr. 1994 747 p
(NASA-TM-4594; M-746; NAS 1.15:4594) Avail: CASI HC A99/MF A06

The Lunar Ultraviolet Telescope Experiment (LUTE) is a 1-meter telescope for imaging from the lunar surface the ultraviolet spectrum between 1,000 and 3,500 angstroms. There have been several endorsements of the scientific value of a LUTE. In addition to the scientific value of LUTE, its educational value and the information it can provide on the design of operating hardware for long-term exposure in the lunar environment are important considerations. This report provides the results of the LUTE phase A activity begun at the George C. Marshall Space Flight Center in early 1992. It describes the objective of LUTE (science, engineering, and education), a feasible reference design concept that has evolved, and the subsystem trades that were accomplished during the phase A. Author

N94-35049*# Space Telescope Science Inst., Baltimore, MD.
PROPAGATING ORIENTATION CONSTRAINTS FOR THE HUBBLE SPACE TELESCOPE
Ashim Bose and Andy Gerb *In* NASA. Goddard Space Flight Center, The 1994 Goddard Conference on Space Applications of Artificial Intelligence May 1994 p 73-86 (For primary document see N94-35043 10-63)
Avail: CASI HC A03/MF A03

90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

For related information see also *75 Plasma Physics*.

N94-33388 Michigan Univ., Ann Arbor, MI.
MULTIPLE SCATTERING OF LIGHT IN A COMET ATMOSPHERE Ph.D. Thesis
Kenneth Martin Chick 1993 173 p
Avail: Univ. Microfilms Order No. DA9319504

A numerical study of the anisotropic multiple scattering of light in a cometary atmosphere is performed. The atmosphere is assumed to be a spherical shell, illuminated by parallel solar rays. The spatial variation of dust in the coma is symmetric about the sun-comet axis ('r-theta geometry'). Two model dust profiles were studied: a spherically symmetric profile and an axisymmetric dust jet at the comet's subsolar point. The specific intensity of multiply-scattered photons is determined throughout the coma by successive approximation to the monochromatic (one-group) transport equation. Direction dependence is treated with discrete ordinates, which are bunched in function of position to avoid ray effects. For each step in the iterative solution we integrate along characteristics in curvilinear geometry. Calculation is made of the flux of visible energy impinging on the nucleus surface, the mean intensity of visible light throughout the coma, and an approximate solution for the flux of thermal radiation at the comet surface due to emission from dust particles in the coma. Coma optical depths are determined at which the flux of scattered photons exceeds the flux of unscattered photons. For all conditions studied, the total radiant flux to the nucleus does not exceed the visible flux on a bare nucleus. Simulated images of a model comet atmosphere as it would be seen by a near-flying satellite, or by general wide-angle imaging techniques, are presented. Nucleus visibility, the effect of forward scattering, and overall jet appearance is examined for varying phase angle. For both the study of energy transfer and the image simulation, conditions are determined under which single and multiple scattering each become significant.
Dissert. Abstr.

N94-33415 Los Alamos National Lab., NM.
BINARY-BINARY COLLISIONS INVOLVING MAIN-SEQUENCE STARS, WHITE DWARFS AND NEUTRON STARS IN GLOBULAR CLUSTERS
P. J. T. Leonard and M. B. Davies 1993 5 p Presented at the Evolution of X Ray Binaries, College Park, MD, 11-13 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by poor print
(Contract W-7405-eng-36)
(DE94-005086; LA-UR-93-4341; CONF-9310265-1) Avail: Issuing Activity (Department of Energy (DOE))

We consider collisions between dynamically-evolved primordial binaries consisting of main-sequence stars, white dwarfs, and neutron stars in globular clusters. In our four-body binary-binary scattering experiments, we allow stars to 'stick' if they pass close enough to each other, which leads to the formation of a wide variety of exotic objects. Most of these objects have binary companions. Also, relatively clean exchange interactions can produce binaries containing neutron stars that eventually receive material from their companions. Such systems will be observable as x-ray binaries. DOE

N94-33562* National Aeronautics and Space Administration, Washington, DC.
COMET IMPACT 1994 ANIMATION REEL (Videotape)
Apr. 1994 Videotape: 6 min. 28 sec. playing time, in color, with sound
(NASA-TM-109810; NONP-VT-94-12938) Avail: CASI VHS A01/BETA A22

This video contains computer generated simulations of the impact of comet Shoemaker-Levy 9 with Jupiter that will take place in July 1994. The simulations display the event from a number of vantage points including earth view, views from orbit, and views from the surface of Jupiter's moons. CASI

N94-33601* National Aeronautics and Space Administration, Washington, DC.
AERONAUTICS AND SPACE REPORTS NUMBER 267: COMET IMPACTS JUPITER (Videotape)
Jun. 1994 Videotape: 15 min. 48 sec. playing time, in color, with sound
(NASA-TM-109841; NONP-VT-94-13198) Avail: CASI VHS A01/BETA A22

This video contains three different segments of computer generated simulations of the impact of comet Shoemaker-Levy 9 with Jupiter that will take place in July 1994. It includes interviews with Shoemaker and Levy, discussing pictures taken at Mt. Kalamar Observatory, the comets approach to Jupiter, fragment size, and the affects of the comets impact on Jupiter and its atmosphere. The impact will be viewed by the Galileo Spacecraft. CASI

N94-33603*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric and Planetary Sciences.
NON-EQUILIBRIUM CHEMISTRY OF THE EARLY SOLAR SYSTEM Final Report, 1 May 1985 - 30 Apr. 1994
Ronald G. Prinn 1994 17 p
(Grant NAG9-108)
(NASA-CR-195691; NAS 1.26:195691) Avail: CASI HC A03/MF A01

This final report contains a list of publications supported in whole or part by NAG9-108 in the time period 1 May 1985 to 30 April 1994. Also contained is a list of invited papers with abstracts supported in whole or part by this grant in the same time period. A copy of the 1993 paper by Ronald G. Prinn, 'Protostars and Planets III', is attached since it had not previously been sent to NASA. CASI

N94-33786# RADEX, Inc., Bedford, MA.
A MODEL OF THE ATMOSPHERIC METAL DEPOSITION BY COSMIC DUST PARTICLES
W. J. McNeil 17 Nov. 1993 82 p
(Contract F19628-93-C-0023)
(AD-A278561; RXR-93111; PL-TR-93-2231; AD-E201850; SR-3) Avail: CASI HC A05/MF A01

We have developed a model of the deposition of meteoric metals in Earth's atmosphere. The model takes as input the total mass influx of material to the Earth and calculates the deposition rate at all altitudes through solution of the drag and subliminal equations in a Monte Carlo-type computation. The diffusion equation is then solved to give steady state concentration of complexes of specific metal species and kinetics are added to calculate the concentration of individual complexes. Concentrating on sodium, we calculate the Na(D) nightglow predicted by the model, and by introduction of seasonal variations in lower tropospheric ozone based on experimental results, we are able to duplicate the seasonal variation of mid-latitude nightglow data. DTIC

N94-33917# California Univ., Berkeley. Lawrence Berkeley Lab, CA.
STIMULATED CERENKOV-RADIATION PROCESSES IN DUSTY AGN
V. Krishan (Indian Inst. of Astrophysics, Bangalore.) Jan. 1994 10 p
(Contract DE-AC03-76SF-00098)
(DE94-009639; LBL-35120) Avail: CASI HC A02/MF A01

An electron moving with a superluminal velocity in a dielectric medium gives rise to spontaneous Cerenkov radiation. If, instead of a single electron, a high density superluminal electron beam is made to pass through a dielectric, the spontaneously generated radiation will grow exponential with distance and is known as stimulated Cerenkov-Compton radiation. If, in addition, an incident electromagnetic field interacts with a strong superluminal or subluminal electron beam, a frequency up-converted stimulated scattered radiation is produced, which by analogy to a similar process in vacuum with subluminal electron beams is known as Cerenkov-Raman radiation. We explore and point out the role of these processes in the dust environs of active galactic nuclei (AGN). Since the refractive index of the dust matter is a key factor in these processes, their inclusion links the properties of the dust grains with the characteristics of the nonthermal continuum especially in the infrared range, which the observations show to be particularly bumpy and therefore requires additional contributions over the thermal continuum. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

N94-33431 California Univ., Los Angeles, CA.
PLASMA WAVES IN THE NIGHTSIDE IONOSPHERE OF VENUS Ph.D. Thesis
Changming Ho 1993 407 p
Avail: Univ. Microfilms Order No. DA9320349

Since Venus is an unmagnetized planet, the solar wind directly interacts with its atmosphere. An extensive comet-like induced magnetosphere is formed which generally stands off the solar wind well above the planet. A variety of plasma wave emissions are observed in the nightside ionosphere by the Pioneer Venus Orbiter electric field detector with its four narrowband channels. In order to determine the state of the plasma in which those waves occur, we examine first the magnetic and plasma structure of the nightside ionosphere. The magnetic field in the equatorial plane that contains the planet, the solar wind flow, and the IMF is well ordered by the upstream IMF as expected for the draping model. The magnetic field is much stronger in the sheath region than in the night ionosphere region directly behind the planet. Near the anti-sunward region the field appears to be more chaotic. In this region there are many density holes inside which the magnetic field is stronger and more radial and plasma beta is lower. The magnetic field strength in the orthogonal, meridian plane is clearly asymmetric. The magnetic field is stronger in the 'northern' hemisphere the direction to which pick up ions are accelerated by the interplanetary electric field. At high altitudes in the night ionosphere, we have observed Langmuir waves presumably associated with solar wind electrons. Along the optical shadow boundary, there are many low frequency signals which may be acoustic waves or may be related to the spacecraft interaction with the background plasma. The discovery that has received the most attention is the existence of many strong impulsive signals in the lower ionosphere. These 100 Hz narrowband signals have all the characteristics of whistler mode signals. They are often associated with stronger and more radial magnetic field and lower plasma density. Their burst rate inside the whistler resonance cone decreases slowly with increasing altitude to a height of 600 km. For higher altitudes beyond 600 km the occurrence rate remains roughly constant. They are not obviously related to the gradients of the field and plasma nor dependent on the spacecraft motion. These

whistler mode signals are consistent with an atmospheric source, that is lightning. High frequency broadband signals are also detected at low altitudes, and clearly peak on the dusk side. Their occurrence rates decrease quickly with altitude with a scale height of about 20 km. They also could be related to a subionospheric source and be triggered by lightning. Most of these features suggest that lightning is prevalent on Venus.
Dissert. Abstr.

N94-33533*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PLANETARY PROTECTION ISSUES AND FUTURE MARS MISSIONS
D. L. DeVincenzi, H. P. Klein, and J. R. Bagby Dec. 1991 63 p Workshop held in Moffett Field, CA, 7-9 Mar. 1990
(RTOP 326-72-00-02)
(NASA-CP-10086; A-92032; NAS 1.55:10086) Avail: CASI HC A04/MF A01

A primary scientific theme for the Space Exploration Initiative (SEI) is the search for life, extant or extinct, on Mars. Because of this, concerns have arisen about Planetary Protection (PP), the prevention of biological cross-contamination between Earth and other planets during solar system exploration missions. A recent workshop assessed the necessity for, and impact of, PP requirements on the unmanned and human missions to Mars comprising the SEI. The following ground-rules were adopted: (1) Information needed for assessing PP issues must be obtained during the unmanned precursor mission phase prior to human landings. (2) Returned Mars samples will be considered biologically hazardous until proven otherwise. (3) Deposition of microbes on Mars and exposure of the crew to martian materials are inevitable when humans land. And (4) Human landings are unlikely until it is demonstrated that there is no harmful effect of martian materials on terrestrial life forms. These ground-rules dictated the development of a conservative PP strategy for precursor missions. Key features of the proposed strategy include: to prevent forward-contamination, all orbiters will follow Mars Observer PP procedures for assembly, trajectory, and lifetime. All landers will follow Viking PP procedures for assembly, microbial load reduction, and bio-shield. And, to prevent back-contamination, all sample return missions will have PP requirements which include fail-safe sample sealing, breaking contact chain with the martian surface, and containment and quarantine analysis in Earth-based laboratory. In addition to deliberating on scientific and technical issues, the workshop made several recommendations for dealing with forward and back-contamination concerns from non-scicntific perspectives. Author

N94-33587* Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
AND THEN THERE WAS VOYAGER (Videotape)
25 Sep. 1990 Videotape: 30 min. 19 sec. playing time, in color, with sound
(NASA-CR-195928; NONP-VT-94-9945) Avail: CASI VHS A01/BETA A22

NASA's legendary grand tour of the outer solar system from the mission conception in the early 1970's is described. The search for the heliopause is discussed. This presentation is told in the words of the key members of the Voyager team. CASI

N94-33600* Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
VOYAGER: THE GRAND TOUR (Videotape)
Mar. 1990 Videotape: 17 min. 51 sec. playing time, in color, with sound
(NASA-TM-109839; NONP-VT-94-12967) Avail: CASI VHS A01/BETA A22

This video presents Voyager 1 & 2 missions from launch, describes findings, and discusses future missions. Animation and interviews are included. CASI

N94-34000*# Delaware Univ., Newark, DE. Research Inst.
MAGNETIC FIELD WAVES AT URANUS Final Report, 1 Dec. 1988 - 30 Nov. 1991
Charles W. Smith, Melvyn L. Goldstein, Ronald P. Lepping, William H. Mish, and Hung K. Wong 5 Jan. 1994 6 p
(Grant NAGw-1514)
(NASA-CR-194807; NAS 1.26:194807) Avail: CASI HC A02/MF A01

The research efforts funded by the Uranus Data Analysis Program (UDAP) grant to the Bartol Research Institute (BRI) involved the study of magnetic field waves associated with the Uranian bow shock. Upstream wave studies are motivated as a study of the physics of collisionless shocks. Collisionless shocks in plasmas are capable of 'reflecting' a fraction of the incoming thermal particle distribution and directing the resulting energetic particle motion back into the upstream region. Once within the upstream region, the backward streaming energetic particles convey information of the approaching shock to the supersonic flow. This particle population is responsible for the generation of upstream magnetic and electrostatic fluctuations known as 'upstream waves', for slowing the incoming wind prior to the formation of the shock ramp, and for heating of the upstream plasma. The waves produced at Uranus not only differed in several regards from the observations at other planetary bow shocks, but also gave new information regarding the nature of the reflected particle populations which were largely unmeasurable by the particle instruments. Four distinct magnetic field wave types were observed upstream of the Uranian bow shock: low-frequency Alfven or fast magnetosonic waves excited by energetic protons originating at or behind the bow shock; whistler wave bursts driven by gyrating ion distributions within the shock ramp; and two whistler wave types simultaneously observed upstream of the flanks of the shock and argued to arise from resonance with energetic electrons. In addition, observations of energetic particle distributions by the LECP experiment, thermal particle populations observed by the PLS experiment, and electron plasma oscillations recorded by the PWS experiment proved instrumental to this study and are included to some degree in the papers and presentations supported by this grant. Derived from text

N94-34092* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EXOBIOLOGY AND SOLAR SYSTEM EXPLORATION (Videotape)
Aug. 1988 Videotape: 4 min. playing time, in color, with sound
(NASA-TM-109850; NONP-VT-94-13713) Avail: CASI VHS A01/BETA A22

The exploration of the solar system through video animation is shown. Actual footage of the Earth's water and land surface is included. ARC

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation.*

N94-33687# Washington Univ., Seattle, WA. Inst. for Nuclear Theory.
SOLAR NEUTRINO OSCILLATIONS
W. C. Haxton 1993 12 p Presented at the International Symposium on Nuclear Structure Physics Today, Taiwan, China, 11-14 May 1993
(Contract DE-FG06-90ER-40561)
(DE94-007265; DOE/ER-40561/115; CONF-9305293-4) Avail: CASI HC A03/MF A01

The special properties of solar neutrinos that render this flux so uniquely important in searches for neutrino masses and flavor mixing are reviewed. The effects of matter, including density fluctuations and turbulence, on solar neutrino oscillations are explained through analogies with more familiar atomic physics phenomena. DOE

N94-33743 California Inst. of Tech., Pasadena, CA. Solar Astronomy Group.
LARGE-SCALE VELOCITY FIELDS AND SMALL-SCALE MAGNETIC FIELDS DURING THE MAXIMUM OF SOLAR CYCLE 22 Final Report, 1 Oct. 1989 - 30 Sep. 1993
Sara F. Martin and K. L. Harvey Feb. 1994 45 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0006-90)
(AD-A278378; AFOSR-94-0176TR) Avail: CASI HC A03

Studies of the solar cycle have revealed that the size distribution of active regions does not vary with the solar cycle. Size, rate of rise, and lifetime of active regions are roughly proportional although a wide range of variation exists among these parameters. The polar field typically reverses about 2 years after solar maximum. The new solar cycle does not seem to start until after the reversal of the sign of the magnetic poles. However, the new solar cycle does overlap appreciably with the previous cycle and begins 3 or more years prior to the minimum in sunspot producing active regions. The solar cycle begins with ephemeral regions at high latitudes. From the analysis of active region and ephemeral region data over more

than a whole solar cycle it is concluded that ephemeral regions are in all respects the small-scale end of the distribution of active regions. No rationale was found for excluding ephemeral regions as one of the effects of the solar dynamo. The search for the early ephemeral regions associated with solar cycle 23 at high latitudes yielded the tentative conclusion that it was detected during our observing runs during the spring of 1993 although confirming data is needed. DTIC

N94-33785 RMA Aerospace, Inc., Mountain View, CA.
DEVELOPMENT OF A PRELIMINARY SOLAR WIND TRANSPORT MAGNETOSHEATH FORECAST MODEL Final Report, Nov. 1991 - Jul. 1993
Stephen S. Stahara, Richard R. Rachiele, Gregory A. Molvik, and John R. Spreiter Jul. 1993 44 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F19628-90-C-0054)
(AD-A278560; PL-TR-93-2169; AD-E201847) Avail: CASI HC A03

An account is provided of the technical work carried out on the development of a preliminary solar wind transport magnetosheath forecast model during the period between delivery of the Phase I SWT model in November 1991 and the early termination of the contract in July 1993. The technical work during this period focused on validation of the SWT model and involved two primary technical tasks: (1) creation of the observational satellite data base against which the model was to be validated, and (2) initial comparative testing of the Phase I SWT model forecasts against these observations. Details of the results obtained from these two technical tasks are discussed. At the present stage of development, the SWT forecast model remains unqualified for operational use. An outline is provided of the technical tasks required to complete the qualification program. DTIC

N94-34091# Los Alamos National Lab., NM.
WORKING GROUP 1: CORONAL STREAMERS
R. A. Kopp 1994 8 p Presented at the 2nd Solar and Heliospheric Observatory Workshop, Isola d'Elba, Italy, 27 Sep. - 1 Oct. 1993
(Contract W-7405-eng-36)
(DE94-009313; LA-UR-94-881; CONF-9309359-1) Avail: CASI HC A02/MF A01

The working group on coronal streamers convened on the first day of the 2nd SOHO Workshop, which took place in Marciana Marina, Isola d'Elba, 27 September--1 October 1993. Recent progress in streamer observational techniques and theoretical modeling was reported. The contribution of streamers to the mass and energy supply for the solar wind was discussed. Moreover, the importance of thin electric current sheets for determining both the gross dynamical properties of streamers and the fine-scale filamentary structure within streamers, was strongly emphasized. Potential advances to our understanding of these areas of coronal physics that could be made by the contingent of instruments aboard SOHO were shown. DOE

N94-34163# National Geophysical Data Center, Boulder, CO.
SOLAR-GEOPHYSICAL DATA NUMBER 593, JANUARY 1994. PART 1: (PROMPT REPORTS). DATA FOR DECEMBER, NOVEMBER 1993, AND LATE DATA
Helen E. Coffey, ed. Jan. 1994 121 p See also PB94-142130, PB94-151586, and PB94-142130
(PB94-151578; SGD-593-Pt-1) Avail: CASI HC A06/MF A02

Contents: Detailed Index for 1993; Data for December 1993--Solar-Terrestrial Environment, IUWDS Alert Periods (Advance and Worldwide), Solar Activity Indices, Solar Flares, Solar Radio Emission, Stanford Mean Solar Magnetic Field; Data for November 1993--Solar Active Regions, Sudden Ionospheric Disturbances, Solar Radio Spectral Observations, Solar Radioheliograph - 164 MHz - Nancay, Cosmic Ray Measurements by Neutron Monitor, Geomagnetic Indices, Principal Magnetic Storms. NTIS

N94-34164# National Geophysical Data Center, Boulder, CO.
SOLAR-GEOPHYSICAL DATA NUMBER 593, JANUARY 1994. PART 2: (COMPREHENSIVE REPORTS). DATA FOR JULY 1993 AND MISCELLANEOUS
Helen E. Coffey, ed. Jan. 1994 56 p See also PB94-142148 and PB94-151578
(PB94-151586; SGD-593-Pt-2) Avail: CASI HC A04/MF A01

Contents: Detailed Index for 1993; Data for July 1993--Solar Flares, Solar Radio Bursts at Fixed Frequencies, Solar X-Ray Radiation from GOES Satellite, Mass Ejections from the Sun, Active Prominences and Filaments; Miscellaneous Data--Total Solar Irradiance--Earth Radiation Budget Satellite (ERBS) October 1984-July 1993. NTIS

N94-34219# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDIES OF IMPULSIVE SOLAR BURSTS OBSERVED WITH HIGH SPECTRAL RESOLUTION IN THE RANGE OF 18 TO 23 GHz M.S. Thesis [ESTUDO DE EXPLOSOES SOLARES IMPULSIVAS OBSERVADAS COM ALTA RESOLUCAO ESPECTRAL NA FAIXA DE 18 A 23 GHZ]
Reinaldo Roberto Rosa Aug. 1992 123 p In PORTUGESE
(INPE-5538-TDI/526) Avail: CASI HC A06/MF A02

For the first time solar burst in the frequency range of 18-23 GHz have been observed with high time (0.6-1.2 sec) and high frequency resolution (1 GHz) since 1989, by using the Itapetinga 13.7 m diameter antenna. Here, we have investigated the microwave type 'simple low level (less than 100 SFU) bursts' associated with impulsive phase of solar flares. Observed properties of these simple bursts are: rise time t(sub r) approximately equals 3 s, decay time t(sub d) approximately equals 8 s and spectral index ranging between -1 and -4. These bursts were found to be associated with SF or SN flares as seen in H-alpha. Above properties suggest that they are likely to be a microwave counterpart of Elementary Flare Bursts (EFB). In the majority of the cases the spectral evolution is soft-hard-soft. This suggests that a nonthermal gyrosynchrotron mechanism is a likely mechanism for generating these Elementary Flare Bursts. Estimated parameters of these simple burst source are height (h approximately equals 2400 km), electron density (N is less than 8,8 x 10 cm) and magnetic field (B approximately equals 310 Gauss). Author

N94-34298*# Lockheed Solar Observatory, Palo Alto, CA. Astrophysics Lab.
OBSERVATIONS OF LOOPS AND PROMINENCES
Keith T. Strong 12 Jan. 1994 37 p Presented at the 2nd SOHO Workshop, Hamburg, Germany
(Contracts NAS8-32334; NAS8-37334)
(NASA-CR-195942; NAS 1.26:195942) Avail: CASI HC A03/MF A01

We review recent observations by the Yohkoh-SXT (Soft X-ray Telescope) in collaboration with other spacecraft and ground-based observatories of coronal loops and prominences. These new results point to problems that SoHO will be able to address. With a unique combination of rapid-cadence digital imaging (greater than or equal to 32 s full-disk and greater than or equal to 2 s partial-frame images), high spatial resolution (greater than or equal to 2.5 arcsec pixels), high sensitivity (EM less than or equal to 10(exp 42) cm(exp -3)), a low-scatter mirror, and large dynamic range, SXT can observe a vast range of targets on the Sun. Over the first 21 months of Yohkoh operations SXT has taken over one million images of the corona and so is building up an invaluable long-term database on the large-scale corona and loop geometry. The most striking thing about the SXT images is the range of loop sizes and shapes. The active regions are a bright tangle of magnetic field lines, surrounded by a network of large-scale quiet-Sun loops stretching over distances in excess of 105 km. The cross-section of most loops seems to be constant. Loops displaying significant Gamma's are the exception, not the rule, implying the presence of widespread currents in the corona. All magnetic structures show changes. Time scales range from seconds to months. The question of how these structures are formed, become filled with hot plasma, and are maintained is still open. While we see the propagation of brightenings along the length of active-region loops and in X-ray jets with velocities of several hundred km/s, much higher velocities are seen in the quiet Sun. In XBP flares, for example, velocities of over 1000 km/s are common. Active-region loops seem to be in constant motion, moving slowly outward, carrying plasma with them. During flares, loops often produce localized brightenings at the base and later at the apex of the loop. Quiescent filaments and prominences have been observed regularly. Their coronal manifestation seems to be an extended arcade of loops overlying the filament. Reliable alignment of the ground-based data with the X-ray images make it possible

to make a detailed intercomparison of the hot and cold plasma structures over extended periods. Hence we are able to follow the long-term evolution of these structures and see how they become destabilized and erupt.
Author

N94-34716*# New Hampshire Univ., Durham. Space Physics Theory Group.
[THEORETICAL STUDIES OF THE SOLAR ATMOSPHERE AND INTERSTELLAR PICKUP IONS] Progress Report, Mar. 1993 - Apr. 1994
22 Apr. 1994 8 p
(Grant NAG5-1479)
(NASA-CR-195846; NAS 1.26:195846) Avail: CASI HC A02/MF A01

Solar atmosphere research activities are summarized. Specific topics addressed include: (1) coronal mass ejections and related phenomena; (2) parametric instabilities of Alfven waves; (3) pickup ions in the solar wind; and (4) cosmic rays in the outer heliosphere. Also included is a list of publications covering the following topics: catastrophic evolution of a force-free flux rope; maximum energy release in flux-rope models of eruptive flares; sheet approximations in models of eruptive flares; material ejection, motions of loops and ribbons of two-ribbon flares; dispersion relations for parametric instabilities of parallel-propagating; parametric instabilities of parallel-propagating Alfven waves; beat, modulation, and decay instabilities of a circularly-polarized Alfven wave; effects of time-dependent photoionization on interstellar pickup helium; observation of waves generated by the solar wind pickup of interstellar hydrogen ions; ion thermalization and wave excitation downstream of the quasi-perpendicular bowshock; ion cyclotron instability and the inverse correlation between proton anisotrophy and proton beta; and effects of cosmic rays and interstellar gas on the dynamics of a wind.
CASI

N94-34944*# Lockheed Missiles and Space Co., Palo Alto, CA. Solar and Astrophysics Lab.
SPARTAN HIGH RESOLUTION SOLAR STUDIES Final Report, 21 May 1987 - 31 Oct. 1993
Marilyn E. Bruner Oct. 1993 24 p Original contains color illustrations
(Contract NAS5-29739)
(NASA-CR-189340; NAS 1.26:189340; ORG-91-30) Avail: CASI HC A03/MF A01; 1 functional color page

This report summarizes the work performed on Contract NAS5-29739, a sub-orbital research program directed toward the study of the geometry of and physical conditions in matter found in the upper layers of the solar atmosphere. The report describes a new sounding rocket payload developed under the contract, presents a guide to the contents of semiannual reports submitted during the contract, discusses the results of the first flight of the payload and the progress on scientific analysis. A bibliography of papers and publications is included.
Author

N94-35225*# TRW Space Technology Labs., Redondo Beach, CA. Electronics Group.
FLANK SOLAR WIND INTERACTION Final Report, Jul. 1991 - Jun. 1994
Stewart L. Moses, Eugene W. Greenstadt, and Ferdinand V. Coroniti 16 May 1994 36 p
(Contract NAS5-31216)
(NASA-CR-189327; NAS 1.26:189327) Avail: CASI HC A03/MF A01

In this report we will summarize the results of the work performed under the 'Flank Solar Wind Interaction' investigation in support of NASA's Space Physics Guest Investigator Program. While this investigation was focused on the interaction of the Earth's magnetosphere with the solar wind as observed by instruments on the International Sun-Earth Explorer (ISEE) 3 spacecraft, it also represents the culmination of decades of research performed by scientists at TRW on the rich phenomenology of collisionless shocks in space.
Derived from text

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

N94-33357 Stanford Univ., CA.
GYRORESONANT SCATTERING OF RADIATION BELT ELECTRONS BY OBLIQUE WHISTLER WAVES Ph.D. Thesis
Jasna Ljiljane Ristic-Djurovic 1993 136 p
Avail: Univ. Microfilms Order No. DA9326456

Radiation belts consist of high energy (tens of eV to tens of MeV) electrons and ions trapped by the earth's magnetic field with particle source and loss processes in a dynamic equilibrium. When scattered in pitch angle, the energetic electrons precipitate into the upper atmosphere where they cause significant disturbances (produce heating, secondary ionization, and conductivity enhancement and emit light or x rays). Interactions with electromagnetic waves are an important means of loss of these particles from the radiation belts. The earth's magnetoplasma supports a large variety of natural and man-made electromagnetic waves amongst which are whistler mode waves. Whistler mode waves are typically in the very low frequency range (hundreds of Hz to tens of kHz), below the electron gyrofrequency so that they can resonantly interact with radiation belt electrons resulting in their precipitation out of the radiation belts and into the atmosphere. A computer simulation model is developed to study the interaction between relativistic charged particles and whistler mode waves traveling obliquely with respect to the ambient magnetic field. This new model is used to investigate the importance of gyroresonant scattering of radiation belt electrons by oblique whistler waves in electron loss from the radiation belts. Application of the model to the parameters of the inner magnetosphere (L is less than or equal to 4) revealed that: oblique whistlers can efficiently scatter significant fluxes of suprathermal (10-100 eV) electrons, higher energy electrons are precipitated from lower L-shells and corresponding precipitated differential electron flux and total precipitated energy flux are higher for higher L-shells, and electron lifetimes due to this loss process are calculated to be of the order of several days and are comparable with lifetimes corresponding to other loss mechanisms (e.g., electron-hiss interactions).
Dissert. Abstr.

N94-33389 Washington Univ., Seattle, WA.
THE FIRST BALLOON FLIGHT AND ACCELERATOR CALIBRATION OF THE SCINTILLATING OPTICAL FIBER ISOTOPE EXPERIMENT Ph.D. Thesis
Paul L. Hink 1992 203 p
Avail: Univ. Microfilms Order No. DA9317389

The Scintillating Optical Fiber Isotope Experiment (SOFIE) is a balloon-borne experiment designed to measure the isotopic abundances of Si through Fe in the galactic cosmic rays (GCR) with energies between 460 and 1200 MeV/nucleon. The SOFIE incorporates three organic scintillation detectors, a fused silica Cherenkov detector, a scintillating optical fiber range detector, and a novel scintillating optical fiber trajectory (SOFT) detector to measure the mass of incident cosmic ray nuclei using the Cherenkov - Range method. I have developed a full-scale balloon-borne version of the SOFIE. This included the design development and test of the instrument based on calculations of the anticipated event rate, nuclear interactions in the instrument, and the response of each detector to the cosmic rays. I have flown the SOFIE on a high-altitude balloon from Prince Albert, Canada, in August of 1988. Although problems with the fiber detectors prevented me from determining the isotopic abundances in the cosmic rays, I was able to verify the function and performance of the instrument. Analysis of data obtained in flight and on the ground enabled me to determine the case of the fiber problem, as well as several additional minor problems. I make a number of suggestions for the follow-on balloon flight that should significantly enhance its scientific results. I performed a calibration of the SOFIE balloon scintillation and Cherenkov detectors at the LBL Bevalac heavy-ion accelerator using Fe-56 nuclei with energies between 415 and 785 MeV/n at the top of the instrument and have found several new results that improve our understanding of the physics of scintillation and Cherenkov detectors. I have also calibrated a test model of the SOFT detector at the Bevalac using a beam of Fe-56 nuclei and obtained a position resolution of 75 microns with 200 micron square fibers.

I give additional laboratory data on the properties of scintillating optical fibers and develop a formalism for predicting their response, including such effects as self-absorption, reflection losses, and energy-loss conversion efficiency. Dissert. Abstr.

N94-33686*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EFFECTS OF ISOTOPE SELECTION ON SOLUTION CONVERGENCE IN HZE TRANSPORT
Myung-Hee Y. Kim (College of William and Mary, Williamsburg, VA.), John W. Wilson, Richard L. Kiefer, and Sheila A. Thibeault May 1994 15 p
(RTOP 199-45-16-11)
(NASA-TP-3445; L-17357; NAS 1.60:3445) Avail: CASI HC A03/MF A01

A fragmenting iron ion produces hundreds of isotopes during nuclear reactions. These isotopes are represented in the solution of the transport problem. A reduced set of isotopes is selected to minimize the computational burden but introduces error in the final result. A minimum list of 122 isotopes is required for adequate representation of the mass and charge distributions of the secondary radiation fields. A reduced set of 80 isotopes is sufficient to represent the charge distribution alone and represents reasonably well the linear energy transfer properties of the iron beam. Because iron fragmentation produces nearly every isotope lighter than iron, the resulting 122-isotope list should be adequate for ion beams with charges equal to or less than 26. Author

N94-34990*# Alabama Univ., Huntsville, AL. Dept. of Physics.
A SEARCH FOR PRE- AND POST-BURST EMISSION FROM WELL-LOCALIZED GAMMA-RAY BURST LOCATIONS Semiannual Report, period ending Mar. 1994
A. Gordon Emslie Apr. 1994 7 p
(Grant NAG5-2373)
(NASA-CR-195825; NAS 1.26:195825) Avail: CASI HC A02/MF A01

We present the results from the first long-term search for nonburst gamma-ray emission from the positions of 70 intense, well-localized bursts. Using the BATSE occultation technique, designed for monitoring of discrete sources, these burst positions were measured in the energy range of approximately 15 keV to 1.8 MeV over a 112 day interval during 1991. None of these 70 locations exhibited detectable emission at or above the level of approximately 5 x 10(exp -9) ergs cm(exp -2) s(exp -1) during the 112 day interval. This level is approximately 1000 times less than the typical intensity of the burst associated with the given location. In addition, 35 intense gamma-ray bursts detected by BATSE were examined in a five day interval centered on the time of detection. We find no compelling evidence that these bursts emit preburst emission or display prompt postburst emission at a level of approximately 5 x 10(exp -9) ergs cm(exp 2) s(exp -1) on timescales of approximately 1 hr or longer. The lack of detectable long-term emission or preburst and postburst emission from the positions of gamma-ray bursts has important consequences for a variety of burst production models. Author (revised)

99 GENERAL

N94-33573* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA REPORT TO EDUCATION, VOLUME 6 (Videotape)
Sep. 1989 Videotape: 26 min. 46 sec. playing time, in color, with sound
(NASA-TM-109818; NONP-VT-94-12946) Avail: CASI VHS A01/BETA A22

Segments include NASA Spacelink, STS-28 Mission, Voyager encounters Neptune, robotics development at GSFC, and the National Boy Scout Jamboree. CASI

N94-33612*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SEVENTH ANNUAL WORKSHOP ON SPACE OPERATIONS APPLICATIONS AND RESEARCH (SOAR 1993), VOLUME 2
Kumar Krishen, ed. Jan. 1994 364 p Workshop held in Houston, TX, 3-5 Aug. 1993; sponsored by NASA, Washington and AF
(NASA-CP-3240-Vol-2; S-749-Vol-2; NAS 1.55:3240-Vol-2) Avail: CASI HC A16/MF A03

This document contains papers presented at the Space Operations, Applications and Research Symposium (SOAR) Symposium hosted by NASA/Johnson Space Center (JSC) and cosponsored by NASA/JSC and U.S. Air Force Materiel Command. SOAR included NASA and USAF programmatic overviews, plenary session, panel discussions, panel sessions, and exhibits. It invited technical papers in support of U.S. Army, U.S. Navy, Department of Energy, NASA, and USAF programs in the following areas: robotics and telepresence, automation and intelligent systems, human factors, life support, and space maintenance and servicing. SOAR was concerned with Government-sponsored research and development relevant to aerospace operations. For individual titles, see N94-33613 through N94-33669.

N94-33613*# Brookhaven National Lab., Upton, NY. Human Factors and Performance Analysis Group.
HFE SAFETY REVIEWS OF ADVANCED NUCLEAR POWER PLANT CONTROL ROOMS **c54**
John OHara *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 329-336 Sponsored by Nuclear Regulatory Commission (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

Advanced control rooms (ACR's) will utilize human-system interface (HSI) technologies that may have significant implications for plant safety in that they will affect the operator's overall role and means of interacting with the system. The Nuclear Regulatory Commission (NRC) reviews the human factors engineering (HFE) aspects of HSI's to ensure that they are designed to good HFE principles and support performance and reliability in order to protect public health and safety. However, the only available NRC guidance was developed more than ten years ago, and does not adequately address the human performance issues and technology changes associated with ACR's. Accordingly, a new approach to ACR safety reviews was developed based upon the concept of 'convergent validity'. This approach to ACR safety reviews is described. Author (revised)

N94-33614*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
USING TASK ANALYSIS TO UNDERSTAND THE DATA SYSTEM OPERATIONS TEAM **c82**
Barbara E. Holder *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 337-344 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

The Data Systems Operations Team (DSOT) currently monitors the Multimission Ground Data System (MGDS) at JPL. The MGDS currently supports five spacecraft and within the next five years, it will support ten spacecraft simultaneously. The ground processing element of the MGDS consists of a distributed UNIX-based system of over 40 nodes and 100 processes. The MGDS system provides operators with little or no information about the system's end-to-end processing status or end-to-end configuration. The lack of system visibility has become a critical issue in the daily operation of the MGDS. A task analysis was conducted to determine what kinds of tools were needed to provide DSOT with useful status information and to prioritize the tool development. The analysis provided the formality and structure needed to get the right information exchange between development and operations. How even a small task analysis can improve developer-operator communications is described, and the challenges associated with conducting a task analysis in a real-time mission operations environment are examined. Author (revised)

N94-33615*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE VIRTUAL MISSION OPERATIONS CENTER **c81**
Mike Moore and Jeffrey Fox *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 345-355 (For primary document see N94-33612 10-99)

(Contract DE-AC06-76RL-01830)
Avail: CASI HC A03/MF A03

Spacecraft management is becoming more human intensive as spacecraft become more complex and as operations costs are growing accordingly. Several automation approaches have been proposed to lower these costs. However, most of these approaches are not flexible enough in the operations processes and levels of automation that they support. This paper presents a concept called the Virtual Mission Operations Center (VMOC) that provides highly flexible support for dynamic spacecraft management processes and automation. In a VMOC, operations personnel can be shared among missions, the operations team can change personnel and their locations, and automation can be added and removed as appropriate. The VMOC employs a form of on-demand supervisory control called management by exception to free operators from having to actively monitor their system. The VMOC extends management by exception, however, so that distributed, dynamic teams can work together. The VMOC uses work-group computing concepts and groupware tools to provide a team infrastructure, and it employs user agents to allow operators to define and control system automation. Author (revised)

N94-33616*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.

MISSION OPERATIONS AND COMMAND ASSURANCE: FLIGHT OPERATIONS QUALITY IMPROVEMENTS c81

Linda L. Welz, Kristin J. Bruno, Sheri L. Kazz, Sherrill S. Potts, and Mona M. Witkowski *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 356-362 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

Mission Operations and Command Assurance (MO&CA) is a Total Quality Management (TQM) task on JPL projects to instill quality in flight mission operations. From a system engineering view, MO&CA facilitates communication and problem-solving among flight teams and provides continuous solving among flight teams and provides continuous process improvement to reduce risk in mission operations by addressing human factors. The MO&CA task has evolved from participating as a member of the spacecraft team, to an independent team reporting directly to flight project management and providing system level assurance. JPL flight projects have benefited significantly from MO&CA's effort to contain risk and prevent rather than rework errors. MO&CA's ability to provide direct transfer of knowledge allows new projects to benefit from previous and ongoing flight experience. Author (revised)

N94-33617*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CALL SIGN INTELLIGIBILITY IMPROVEMENT USING A SPATIAL AUDITORY DISPLAY c32

Durand R. Begault *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 363-370 Sponsored in part by NASA. Kennedy Space Center (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

A spatial auditory display was designed for separating the multiple communication channels usually heard over one ear to different virtual auditory positions. The single 19 foot rack mount device utilizes digital filtering algorithms to separate up to four communication channels. The filters use four different binaural transfer functions, synthesized from actual outer ear measurements, to impose localization cues on the incoming sound. Hardware design features include 'fail-safe' operation in the case of power loss, and microphone/headset interfaces to the mobile launch communication system in use at KSC. An experiment designed to verify the intelligibility advantage of the display used 130 different call signs taken from the communications protocol used at NASA KSC. A 6 to 7 dB intelligibility advantage was found when multiple channels were spatially displayed, compared to monaural listening. The findings suggest that the use of a spatial auditory display could enhance both occupational and operational safety and efficiency of NASA operations. Author (revised)

N94-33618*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.

LABORATORY AND IN-FLIGHT EXPERIMENTS TO EVALUATE 3-D AUDIO DISPLAY TECHNOLOGY c32

Mark Ericson, Richard McKinley, Marion Kibbe, and Daniel Francis *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 371-377 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

Laboratory and in-flight experiments were conducted to evaluate 3-D audio display technology for cockpit applications. A 3-D audio display generator was developed which digitally encodes naturally occurring direction information onto any audio signal and presents the binaural sound over headphones. The acoustic image is stabilized for head movement by use of an electromagnetic head-tracking device. In the laboratory, a 3-D audio display generator was used to spatially separate competing speech messages to improve the intelligibility of each message. Up to a 25 percent improvement in intelligibility was measured for spatially separated speech at high ambient noise levels (115 dB SPL). During the in-flight experiments, pilots reported that spatial separation of speech communications provided a noticeable improvement in intelligibility. The use of 3-D audio for target acquisition was also investigated. In the laboratory, 3-D audio enabled the acquisition of visual targets in about two seconds average response time at 17 degrees accuracy. During the in-flight experiments, pilots correctly identified ground targets 50, 75, and 100 percent of the time at separation angles of 12, 20, and 35 degrees, respectively. In general, pilot performance in the field with the 3-D audio display generator was as expected, based on data from laboratory experiments. Author (revised)

N94-33619*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.

FUSION INTERFACES FOR TACTICAL ENVIRONMENTS: AN APPLICATION OF VIRTUAL REALITY TECHNOLOGY c54

Michael W. Haas *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 378-387 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

The term Fusion Interface is defined as a class of interface which integrally incorporates both virtual and nonvirtual concepts and devices across the visual, auditory, and haptic sensory modalities. A fusion interface is a multisensory virtually-augmented synthetic environment. A new facility has been developed within the Human Engineering Division of the Armstrong Laboratory dedicated to exploratory development of fusion interface concepts. This new facility, the Fusion Interfaces for Tactical Environments (FITE) Facility is a specialized flight simulator enabling efficient concept development through rapid prototyping and direct experience of new fusion concepts. The FITE Facility also supports evaluation of fusion concepts by operation fighter pilots in an air combat environment. The facility is utilized by a multidisciplinary design team composed of human factors engineers, electronics engineers, computer scientists, experimental psychologists, and oeprational pilots. The FITE computational architecture is composed of twenty-five 80486-based microcomputers operating in real-time. The microcomputers generate out-the-window visuals, in-cockpit and head-mounted visuals, localized auditory presentations, haptic displays on the stick and rudder pedals, as well as executing weapons models, aerodynamic models, and threat models. Author (revised)

N94-33620*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

VIRTUAL REALITY AS A HUMAN FACTORS DESIGN ANALYSIS TOOL: MACRO-ERGONOMIC APPLICATION VALIDATION AND ASSESSMENT OF THE SPACE STATION FREEDOM PAYLOAD CONTROL AREA Abstract Only c54

Joseph P. Hale *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 388 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

A virtual reality (VR) Applications Program has been under development at MSFC since 1989. Its objectives are to develop, assess, validate, and utilize VR in hardware development, operations development and support, missions operations training, and science training. A variety of activities are under way within many of these areas. One ongoing macro-ergonomic application of VR relates to the design of the Space Station Freedom Payload Control Area (PCA), the control room from which onboard payload

operations are managed. Several preliminary conceptual PCA layouts have been developed and modeled in VR. Various managers and potential end users have virtually 'entered' these rooms and provided valuable feedback. Before VR can be used with confidence in a particular application, it must be validated, or calibrated, for that class of applications. Two associated validation studies for macro-ergonomic applications are under way to help characterize possible distortions of filtering of relevant perceptions in a virtual world. In both studies, existing control rooms and their 'virtual counterparts will be empirically compared using distance and heading estimations to objects and subjective assessments. Approaches and findings of the PCA activities and details of the studies are presented.

Author (revised)

N94-33621*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A RAPID ALGORITHM FOR REALISTIC HUMAN REACHING AND ITS USE IN A VIRTUAL REALITY SYSTEM c54

Ann Aldridge (Lockheed Engineering and Sciences Co., Houston, TX.), Abhilash Pandya (Lockheed Engineering and Sciences Co., Houston, TX.), Michael Goldsby (Lockheed Engineering and Sciences Co., Houston, TX.), and James Maida *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 389-394 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

The Graphics Analysis Facility (GRAF) at JSC has developed a rapid algorithm for computing realistic human reaching. The algorithm was applied to GRAF's anthropometrically correct human model and used in a 3D computer graphics system and a virtual reality system. The nature of the algorithm and its uses are discussed. Author

N94-33622*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

AUTOGENIC-FEEDBACK TRAINING IMPROVES PILOT PERFORMANCE DURING EMERGENCY FLYING CONDITIONS c53

Michael A. Kellar (Tripler Army Medical Center, Honolulu, HI.), Raymond A. Folen (Tripler Army Medical Center, Honolulu, HI.), Patricia S. Cowings, William B. Toscano, and Glen L. Hisert *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 395-403 See also N93-27076 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

Studies have shown that autonomous mode behavior is one cause of aircraft fatalities due to pilot error. In such cases, the pilot is in a high state of psychological and physiological arousal and tends to focus on one problem, while ignoring more critical information. This study examined the effect of training in physiological self-recognition and regulation, as a means of improving crew cockpit performance. Seventeen pilots were assigned to the treatment and control groups matched for accumulated flight hours. The treatment group comprised three pilots of HC-130 Hercules aircraft and four HH-65 Dolphin helicopter pilots; the control group comprised three pilots of HC-130's and six Dolphin helicopter pilots. During an initial flight, physiological data were recorded for each crew member and individual crew performance was rated by an instructor pilot. Eight crewmembers were then taught to regulate their own physiological response levels using Autogenic-Feedback Training (AFT). The remaining subjects received no training. During a second flight, treatment subjects showed significant improvement in performance, while controls did not improve. The results indicate that AFT management of high states of physiological arousal may improve pilot performance during emergency flying conditions.

Derived from text

N94-33623*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

IMPLEMENTING BRIGHT LIGHT TREATMENT FOR MSFC PAYLOAD OPERATIONS SHIFTWORKERS Abstract Only c53

Benita C. Hayes, Karen T. Stewart, and Charmane I. Eastman *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 404 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

Intense light can phase-shift circadian rhythms and improve performance, sleep, and wellbeing during shiftwork simulations, but to date there have been very few attempts to administer light treatment to real shiftworkers. We have developed procedures for implementing light treatment and have conducted controlled trials of light treatment for MSFC Payload Operations staff during the USML-1 mission. We found that treatment had beneficial effects on fatigue, alertness, self-rated job performance, sleep, mood, and work attendance. Although there are portable bright light boxes commercially available, there is no testing protocol and little performance information available. We measure the illuminance of two candidate boxes for use in this study and found that levels were consistently lower than those advertised by manufacturers. A device was developed to enhance the illuminance output of such units. This device increased the illuminance by at least 60 % and provided additional improvements in visual comfort and overall exposure. Both the design of this device and some suggested procedures for evaluating light devices are presented. Author (revised)

N94-33624*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

FLIGHT CONTROLLER ALERTNESS AND PERFORMANCE DURING MOD SHIFTWORK OPERATIONS c53

Sean M. Kelly, Mark R. Rosekind, David F. Dinges, Donna L. Miller, Kelly A. Gillen, Kevin B. Gregory, Ronald D. Aguilar, and Roy M. Smith *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 405-416 Sponsored in part by Inst. for Experimental Psychiatry Research Foundation (For primary document see N94-33612 10-99)

(Contract NCC2-599)

Avail: CASI HC A03/MF A03

Decreased alertness and performance associated with fatigue, sleep loss, and circadian disruption are issues faced by a diverse range of shiftwork operations. During STS operations, MOD personnel provide 24 hr. coverage of critical tasks. A joint JSC and ARC project was undertaken to examine these issues in flight controllers during MOD shiftwork operations. An initial operational test of procedures and measures was conducted during STS-53 in Dec. 1992. The study measures included a background questionnaire, a subjective daily logbook completed on a 24 hr. basis (to report sleep patterns, work periods, etc.), and an 8 minute performance and mood test battery administered at the beginning, middle, and end of each shift period. Seventeen Flight controllers representing the 3 Orbit shifts participated. The initial results clearly support further data collection during other STS missions to document baseline levels of alertness and performance during MOD shiftwork operations. These issues are especially pertinent for the night shift operations and the acute phase advance required for the transition of day shift personnel into the night for shuttle launch. Implementation and evaluation of the countermeasure strategies to maximize alertness and performance is planned. As STS missions extend to further extended duration orbiters, timelines and planning for 24 circadian disruption will remain highly relevant in the MOD environment. Author (revised)

N94-33625*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.

AUTOMATING THE TRAINING DEVELOPMENT PROCESS FOR MISSION FLIGHT OPERATIONS c53

Carol J. Scott *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 417-425 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

Traditional methods of developing training do not effectively support the changing needs of operational users in a multimission environment. The Automated Training Development System (ATDS) provides advantages over conventional methods in quality, quantity, turnaround, database maintenance, and focus on individualized instruction. The Operations System Training Group at the JPL performed a six-month study to assess the potential of ATDS to automate curriculum development and to generate and maintain course materials. To begin the study, the group acquired readily available hardware and participated in a two-week training session to introduce the process. ATDS is a building activity that combines training's traditional information-gathering with a hierarchical method for interleaving the elements. The program can be described fairly simply. A comprehensive list of candidate tasks determines the content of the database; from that database, selected critical tasks dictate which competencies of skill and knowledge to include in course material for the target audience. The training developer adds pertinent planning information about each task to the

database, then ATDS generates a tailored set of instructional material, based on the specific set of selection criteria. Course material consistently leads students to a prescribed level of competency. Author (revised)

N94-33626*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

APPLICATION OF STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY ANALYSIS PROCEDURES IN ORBITER PROCESSING ACTIVITIES AT THE KENNEDY SPACE CENTER **c38**

Robert R. Safford (University of Central Florida, Orlando.), Andrew E. Jackson (University of Central Florida, Orlando.), William W. Swart (University of Central Florida, Orlando.), and Timothy S. Barth *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 427-431 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

Successful ground processing at KSC requires that flight hardware and ground support equipment conform to specifications at tens of thousands of checkpoints. Knowledge of conformance is an essential requirement for launch. That knowledge of conformance at every requisite point does not, however, enable identification of past problems with equipment, or potential problem areas. This paper describes how the introduction of Statistical Process Control and Process Capability Analysis identification procedures into existing shuttle processing procedures can enable identification of potential problem areas and candidates for improvements to increase processing performance measures. Results of a case study describing application of the analysis procedures to Thermal Protection System processing are used to illustrate the benefits of the approaches described in the paper. Author

N94-33627*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TASK NETWORK MODELS IN THE PREDICTION OF WORKLOAD IMPOSED BY EXTRAVEHICULAR ACTIVITIES DURING THE HUBBLE SPACE TELESCOPE SERVICING MISSION **c54**

Manuel F. Diaz (Lockheed Engineering and Sciences Co., Houston, TX.), Neal Takamoto (Air Force Systems Command, Brooks AFB, TX.), and Barbara Woolford *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 432-436 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

In a joint effort with Brooks AFB, Texas, the Flight Crew Support Division at JSC has begun a computer simulation and performance modeling program directed at establishing the predictive validity of software tools for modeling human performance during spaceflight. This paper addresses the utility of task network modeling for predicting the workload that astronauts are likely to encounter in extravehicular activities (EVA) during the Hubble Space Telescope (HST) repair mission. The intent of the study was to determine whether two EVA crewmembers and one intravehicular activity (IVA) crewmember could reasonably be expected to complete HST Wide Field/Planetary Camera (WFPC) replacement in the allotted time. Ultimately, examination of the points during HST servicing that may result in excessive workload will lead to recommendations to the HST Flight Systems and Servicing Project concerning (1) expectation of degraded performance, (2) the need to change task allocation across crewmembers, (3) the need to expand the timeline, and (4) the need to increase the number of EVA's. Author (revised)

N94-33628*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.

A HUMAN FACTORS EVALUATION USING TOOLS FOR AUTOMATED KNOWLEDGE ENGINEERING **c54**

Marie E. Gomes and Stephanie Lind *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 437-441 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

A human factors evaluation of the MH-53J helicopter cockpit is described. This evaluation was an application and futher development of Tools for Automated Knowledge Engineering (TAKE). TAKE is used to acquire and analyze knowledge from domain experts (aircrew members, system designers, maintenance personnel, human factors engineers, or others). TAKE was successfully utilized for the purpose of recommending improvements for the man-machine interfaces (MMI) in the MH-53J cockpit. Author (revised)

N94-33629*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

AN OVERVIEW OF SPACE SHUTTLE ANTHROPOMETRY AND BIOMECHANICS RESEARCH WITH EMPHASIS ON STS/MIR RECUMBENT SEAT SYSTEM DESIGN **c54**

Glenn K. Klute and Lara E. Stoycos *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 442-446 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

The Anthropometry and Biomechanics Laboratory (ABL) at JSC conducts multi-disciplinary research focusing on maximizing astronaut intravehicular (IVA) and extravehicular (EVA) capabilities to provide the most effective work conditions for manned space flight and exploration missions. Biomechanics involves the measurement and modeling of the strength characteristics of the human body. Current research for the Space Shuttle Program includes the measurement of torque wrench capability during weightlessness, optimization of foot restraint, and hand hold placement, measurements of the strength and dexterity of the pressure gloved hand to improve glove design, quantification of the ability to move and manipulate heavy masses (6672 N or 1500 lb) in weightlessness, and verification of the capability of EVA crewmembers to perform Hubble Space Telescope repair tasks. Anthropometry is the measurement and modeling of the dimensions of the human body. Current research for the Space Shuttle Program includes the measurement of 14 anthropometric parameters of every astronaut candidate, identification of EVA finger entrapment hazards by measuring the dimensions of the gloved hand, definition of flight deck reach envelopes during launch and landing accelerations, and measurement of anthropometric design parameters for the recumbent seat system required for the Shuttle/Mir mission (STS-71, Spacelab M) scheduled for Jun. 1995. Author (revised)

N94-33630*# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.

ANTHROPOMETRIC ACCOMMODATION IN USAF COCKPITS **c54**

Gregory F. Zehner *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 447-459 (For primary document see N94-33612 10-99)

Avail: CASI HC A03/MF A03

Over the past three years, a new set of methodologies has been developed to specify and evaluate anthropometric accommodation in USAF crewstation designs. These techniques are used to improve the ability of the pilot to reach controls, to safely escape the aircraft, to achieve adequate mobility and comfort, and to assure full access to the visual field both inside and outside the aircraft. This paper summarized commonly encountered aircraft accommodation problems, explains the failure of the traditional 'percentile man' design concept to resolve these difficulties, and suggests an alternative approach for improving cockpit design to better accommodate today's more heterogeneous flying population. Author (revised)

N94-33631*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

END EFFECTOR MONITORING SYSTEM: AN ILLUSTRATED CASE OF OPERATIONAL PROTOTYPING **c61**

Jane T. Malin, Sherry A. Land, and Carroll Thronesbery *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 461-467 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

Operational prototyping is introduced to help developers apply software innovations to real-world problems, to help users articulate requirements, and to help develop more usable software. Operational prototyping has been applied to an expert system development project. The expert system supports fault detection and management during grappling operations of the Space Shuttle payload bay arm. The dynamic exchanges among operational prototyping team members are illustrated in a specific prototyping

session. We discuss the requirements for operational prototyping technology, types of projects for which operational prototyping is best suited and when it should be applied to those projects. Author (revised)

N94-33632*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE PLAID GRAPHICS ANALYSIS IMPACT ON THE SPACE PROGRAM c61
Jennifer P. Nguyen (Lockheed Engineering and Sciences Co., Houston, TX.), Aneice L. Wheaton (Lockheed Engineering and Sciences Co., Houston, TX.), and James C. Maida *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 468-474 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

An ongoing project design often requires visual verification at various stages. These requirements are critically important because the subsequent phases of that project might depend on the complete verification of a particular stage. Currently, there are several software packages at JSC that provide such simulation capabilities. We present the simulation capabilities of the PLAID modeling system used in the Flight Crew Support Division for human factors analyses. We summarize some ongoing studies in kinematics, lighting, EVA activities, and discuss various applications in the mission planning of the current Space Shuttle flights and the assembly sequence of the Space Station Freedom with emphasis on the redesign effort. Author (revised)

N94-33633*# Compaq Computer Corp., Houston, TX.
HUMAN FACTORS INVOLVEMENT IN BRINGING THE POWER OF AI TO A HETEROGENEOUS USER POPULATION c61
Mary Czerwinski and Trung Nguyen *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 475-482 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

The Human Factors involvement in developing COMPAQ QuickSolve, an electronic problem-solving and information system for Compaq's line of networked printers, is described. Empowering customers with expert system technology so they could solve advanced networked printer problems on their own was a major goal in designing this system. This process would minimize customer down-time, reduce the number of phone calls to the Compaq Customer Support Center, improve customer satisfaction, and, most importantly, differentiate Compaq printers in the marketplace by providing the best, and most technologically advanced, customer support. This represents a re-engineering of Compaq's customer support strategy and implementation. In its first generation system, SMART, the objective was to provide expert knowledge to Compaq's help desk operation to more quickly and correctly answer customer questions and problems. QuickSolve is a second generation system in that customer support is put directly in the hands of the consumers. As a result, the design of QuickSolve presented a number of challenging issues. Because the produce would be used by a diverse and heterogeneous set of users, a significant amount of human factors research and analysis was required while designing and implementing the system. Research that shaped the organization and design of the expert system component as well. Author (revised)

N94-33634*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A COMPARISON OF PAPER AND COMPUTER PROCEDURES IN A SHUTTLE FLIGHT ENVIRONMENT c54
Michael ONeal (Lockheed Engineering and Sciences Co., Houston, TX.), Kritina Holden (Lockheed Engineering and Sciences Co., Houston, TX.), Steve Wolf (Lockheed Engineering and Sciences Co., Houston, TX.), and Frances Mount *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 483-491 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

The Electronic Procedures Experiment (EPROC) was flown as part of the Human Factors Assessment (HFA) experiment aboard the SpaceHab-1/STS-57 mission. EPROC is concerned with future, longer-duration missions which will increasingly rely on electronic procedures since they are more easily launched, updated in-flight, and offer automatic or on-request capabilities not available with paper. A computer-based task simulating a Space Station Propulsion System task was completed by one crewmember. The crewmember performed the task once using paper and once using computer procedures. A soldering and desoldering task was performed by another crewmember. Soldering was completed with paper procedures and desoldering was completed using computer procedures. Objective data was collected during each task session from the computer programs, videotapes, and crew notations in the paper and computer procedures. After each task session, subjective data was collected through the use of a computer-based questionnaire program. Resultant recommendations will be made available to future designers of electronic procedures systems for manned-space missions and other related uses. Author (revised)

N94-33635*# Aerospace Medical Research Labs., Brooks AFB, TX.
GRAVITY, THE THIRD DIMENSION OF LIFE SUPPORT IN SPACE Abstract Only c54
Russell R. Burton *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 493 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

The ascent of the human into high altitudes required a 2-D life support system that supplied: oxygen, and heat. At lower altitudes, increased oxygen concentration in the inhaled gases was useful, but at higher altitudes for longer durations, this 'clever' life support approach was no longer adequate--physiologic requirements had to provide a natural pressure-based environment. In space, the life support system requires a third dimension, gravity. Although substituting for gravity has been successful on a limited number of physiologic functions for short-duration stays in space, long durations will require the effects of the real thing for critical physiologic functions. It has been known for over a hundred years that the forces of acceleration (G) and gravity are equivalent. Therefore, gravitational stimulation in space can be achieved with centrifugation. However, for this stimulation to be effective, the dosage of G required to maintain normal physiologic function must be determined. An approximation of this dosage of G for the human can be determined with 3-day bed-rest studies including periodic centrifuge exposure. Recent research on this topic is reviewed. Author (revised)

N94-33636*# Naval Air Warfare Center, Warminster, PA.
THE US NAVY/CANADIAN DCIEM RESEARCH INITIATIVE ON PRESSURE BREATHING PHYSIOLOGY Abstract Only c54
Phillip E. Whitley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 494 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

Development of improved positive pressure breathing garments for altitude and acceleration protection has occurred without collection of sufficient physiological data to understand the mechanisms of the improvement. Furthermore, modeling of the predicted response of future enhanced garments is greatly hampered by this lack of information. A joint, international effort is under way between Canada's Defense and Civil Institute for Environmental Medicine (DCIEM) and the US Navy's Naval Air Warfare Center Aircraft Division, Warminster (NAWCACDIVWAR). Using a Canadian subject pool, experiments at both the DCIEM altitude facility and the NAWCADIVWAR Dynamic Flight Simulator have been conducted to determine the cardiovascular and respiratory consequences of high levels of positive pressure breathing for altitude and positive pressure breathing for acceleration protection. Various improved pressure breathing garments were used to collect comparative physiological and performance data. New pressure breathing level and durahon capabilities have been encountered. Further studies will address further improvements in pressure suit design and correlation of altitude and acceleration data. Author (revised)

N94-33637*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RESPONSE TO GRADED LOWER BODY NEGATIVE PRESSURE (LBNP) AFTER SPACE FLIGHT Abstract Only c52
S. Fortney, J. Charles, M. Wood, and T. Dussack *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993),

Volume 2 Jan. 1994 p 495 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

The effects of space flight on orthostatic function were studied. LBNP tests (0 to -60 mmHg) were administered to 7 crew members preflight and 2 to 6 hrs after 6 to 9 day shuttle missions. Cardiac stroke volumes were obtained each minute by echo Doppler. Orthostatic responses are given. The data suggest a decline in postflight orthostatic function, as assessed by LBNP, due to reduced cardiac filling despite potentiated heart rate and vasoconstrictor reflex responses in most crew members.

Derived from text

N94-33638*# Krug Life Sciences, Inc., San Antonio, TX.
DUAL-CYCLE ERGOMETRY AS AN EXERCISE MODALITY DURING PREBREATHE WITH 100 PERCENT OXYGEN Abstract Only **c52**
Cristine L. Heaps, Michele D. Fischer, and James T. Webb *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 496 Prepared in cooperation with Aerospace Medical Research Labs., Brooks AFB, TX (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

In an effort to reduce prebreathe time requirements prior to extravehicular activities and high-altitude flights, a combined arm and leg exercise task proposes to enhance denitrogenation by incorporation of both upper and lower body musculature at a moderately high work intensity during prebreathe with 100% oxygen. Preliminary findings indicated peak oxygen consumption (VO2peak) levels attained on the dual-cycle ergometer do not differ significantly from those levels attained on the treadmill. Eight male subjects were exercised to VO2peak using leg-only cycle ergometry and dual-cycle ergometry on separate days. Preliminary data during dual-cycle ergometry showed arm work equaling 30% of the leg workrate at each stage of the incremental test resulted in arm fatigue in several subjects and a reduced VO2peak compared to dual-cycle ergometry with arm work at 20%. Thus, the 20% workrate was used during the dual-cycle VO2peak trial. On a third experimental day, subjects performed a 10 minute exercise test at a workrate required to elicit 75% of VO2peak for each subject on the dual-cycle ergometer. Blood lactate response to the exercise was monitored as an objective measure of fatigue. Peak VO2 levels attained on the leg-only and the dual-cycle ergometry tasks were not significantly different. Blood lactate levels were significantly elevated following the dual-cycle ergometry at 75% VO2peak. However, lactate levels show the expected rate of decline during recovery and, as demonstrated in the literature, should return to baseline levels within 30 minutes following exercise cessation. Thus, dual-cycle ergometry at 75% VO2peak appears to be a valid exercise for use during prebreathe and should not contribute to fatigue during subsequent EVA's. Author (revised)

N94-33639*# Krug Life Sciences, Inc., San Antonio, TX.
EXERCISE WITH PREBREATHE APPEARS TO INCREASE PROTECTION FROM DECOMPRESSION SICKNESS: PRELIMINARY FINDINGS **c52**
James T. Webb, Michele D. Fischer, Cristine L. Heaps, and Andrew A. Pilmanis *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 497-500 Sponsored in part by Aerospace Medical Research Labs. (For primary document see N94-33612 10-99)
(Contracts NASA Order T-82170; F33615-89-C-0603; F33615-92-C-0018)
Avail: CASI HC A01/MF A03

Extravehicular activity (EVA) from the Space Shuttle involves one hour of prebreath with 100% oxygen, decompression of the entire Shuttle to 10.2 psia for at least 12 hours, and another prebreath for 40 minutes before decompression to the 4.3 psia suit pressure. We are investigating the use of a one-hour prebreathe with 100% oxygen beginning with a ten-minute strenuous exercise period as an alternative for the staged decompression schedule described above. The 10-minute exercise consists of dual-cycle ergometry performed at 75% of the subject's peak oxygen uptake to increase denitrogenation efficiency by increasing ventilation and perfusion. The control exposures were preceded by a one-hour prebreathe with 100% oxygen while resting in a supine position. The twenty-two male subjects were exposed to 4.3 psia for 4 hours while performing light to moderate exercise. Preliminary results from 22 of the planned 26 subjects indicate 76% DCS following supine, resting prebreathe and 38% following prebreathe with exercise. The staged decompression schedule has been shown to result in 23% DCS which is not significantly different from the exercise-enhanced prebreathe results. Prebreathe including exercise appears to be comparable to the protection afforded by the more lengthy staged decompression schedule. Completion of the study later this year will enable planned statistical analysis of the results. Author (revised)

N94-33640*# Army Research Inst. of Environmental Medicine, Natick, MA.
ORTHOSTATIC RESPONSES TO DIETARY SODIUM RESTRICTION DURING HEAT ACCLIMATION **c52**
Patricia C. Szlyk, Ingrid V. Sils, David M. Caretti, Robert J. Moore, Lawrence E. Armstrong, Kim A. Tartarini, Ralph P. Francesconi, Eldon W. Askew, and Roger W. Hubbard *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 501-508 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

Several studies have shown that individuals consuming low-salt diets and working in the heat have an increased risk or incidence of heat injury, suggestive of inadequate cardiovascular adjustment. Furthermore, others have shown that prolonged work in hot climates can precipitate orthostatic hypotension and syncope. This study was designed to evaluate the effects of moderate-salt (MS) and low-salt (LS) diets on the circulatory responses and incidence of presyncopal symptoms to an orthostatic test (OT) during successive days of heat acclimation (HA). Seventeen unacclimatized male soldiers (mean +/- SE: age 20+/-1 yrs) participated in this two-phase study. The first phase consisted of a seven day dietary stabilization period during which all subjects consumed similar diets of about 4000 kcal/day containing 8g NaCl and lived in a dormitory setting (21 C, 30% RH). The second phase commenced on day eight and consisted of dietary NaCl restriction and 10 days HA (days 8-17). Volunteers were randomly assigned to either the MS diet (n=9) providing 8g NaCl/day or the LS diet (n=8) furnishing just 4g NaCl/day. The acquisition of HA was manifested in both groups by reductions in exercising rectal temperature and heart rate (HR); these characteristics were similar in the MS and LS diets. The OT was performed at 21 C on day seven of the stabilization phase and on days 9, 11, 13, 15, and 17 of the HA phase, before and after 8.5 hr of intermittent treadmill walking in a hot environment. Blood pressure (BP) and HR responses at 1,2, and 4 min and any presyncopal symptoms were recorded after assuming an upright position from recumbency. All subjects completed the OT before and after prolonged exercise in the heat without incidence of either hypotension or presyncopal symptoms irrespective of dietary-salt intake and day of HA. The results indicate that the prolonged work in the heat can be performed without orthostatic hypotension or syncope while consuming 4g NaCl/day with adequate fluid replacement. Furthermore, the circulatory responses to OT showed no improvement with successive days of HA irrespective of dietary-salt intake. Author (revised)

N94-33641*# Naval Air Warfare Center, China Lake, CA.
TELEMEDICINE, VIRTUAL REALITY, AND SURGERY **c52**
Percival D. McCormack and Steve Charles *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 509-521 (For primary document see N94-33612 10-99)
Avail: CASI HC A03/MF A03

Two types of synthetic experience are covered: virtual reality (VR) and surgery, and telemedicine. The topics are presented in viewgraph form and include the following: geometric models; physiological sensors; surgical applications; virtual cadaver; VR surgical simulation; telesurgery; VR Surgical Trainer; abdominal surgery pilot study; advanced abdominal simulator; examples of telemedicine; and telemedicine spacebridge.

Derived from text

N94-33642*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TOTAL HYDROCARBON ANALYSIS BY ION MOBILITY SPECTROMETRY **c54**
John H. Cross (Krug Life Sciences, Inc., Houston, TX.), Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.), and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research

(SOAR 1993), Volume 2 Jan. 1994 p 522-531 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

Astronauts must be alerted quickly to chemical leaks that compromise their health and the success of their missions. An ideal leak detector would be equally sensitive to all compounds that might constitute a hazard and insensitive to nontoxic compounds. No ideal sensor exists; thus, selection of a methodology is a series of compromises. The commonly used methods are either insensitive at the low exposure levels set by OSHA, NASA, and other organizations or are selectively insensitive to important classes of chemicals such as Freons. After extensive study and experience, the Toxicology Group at JSC has selected ion mobility spectrometry (IMS) for development into a broad range, sensitive detector. In addition to the sensing method, signal processing is important leak detection because a background signal can be expected at all times. The leak-detecting instrument must be programmed to discriminate between authentic leaks and background fluctuations caused by routine operations. The results of an evaluation of the prototype THA is presented in terms related to spacecraft operations. The evaluation included determination of instrumental parameters such as stability and response times. We also included responses to some common components of spacecraft atmospheres in pure form and in binary and ternary mixtures. The output of the four algorithms to the mixtures was found to be noticeably different. These responses are compared on the basis of their utility for signaling a chemical leak. As a means of evaluating its resistance to a falsely positive response, the THA was challenged with carbon dioxide and methane, compounds whose concentrations normally increase in spacecraft air during human habitation. The instrument showed virtually no response to these interferences. Although the prototype THA is designed for space flight, this detector is expected to be useful for field screening at chemical waste dumps and other environmentally sensitive locations. Author (revised)

N94-33643*# Aerospace Medical Research Labs., Brooks AFB, TX.
THE EFFECTIVENESS OF GROUND LEVEL POST-FLIGHT 100 PERCENT OXYGEN BREATHING AS THERAPY FOR PAIN-ONLY ALTITUDE DECOMPRESSION SICKNESS (DCS) **c52**
John T. Demboski and Andrew A. Pilmanis *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 532-537 (For primary document see N94-33612 10-99)
Avail: CASI HC A02/MF A03

In both the aviation and space environments, decompression sickness (DCS) is an operational limitation. Hyperbaric recompression is the most efficacious treatment for altitude DCS. However, the inherent recompression of descent to ground level while breathing oxygen is in itself therapy for altitude DCS. If pain-only DCS occurs during a hypobaric exposure, and the symptoms resolver during descent, ground level post-flight breathing of 100% O2 for 2 hours (GLO2) is considered sufficient treatment by USAF Regulation 161-21. The effectiveness of the GLO2 treatment protocol is defined. Derived from text

N94-33644*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EMERGENCY MEDICAL SERVICES **c52**
Roger Billica and Michael Chandler *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 538-539 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

When NASA was established in 1958, it was known that space flight would require efforts beyond those of NASA to ensure the health and safety of our astronauts. On 10 Aug. 1958, a Secretary of Defense memorandum was signed that assigned the first Department of Defense (DOD) Manager to provide support to NASA for Project Mercury. This established a chain of command through the Joint Chiefs of Staff to the Secretary of Defense. The current charter is dated 19 Mar. 1986 and assigns the DOD Manager responsibilities to the Commander and Chief, US Space Command. The DOD Managers charter has many support areas and among them are recovery of astronauts and medical support. Today these efforts support the Space Shuttle and Space Station Programs. Briefly, the program works with each organization tasking the other through a requirements document. Level of care, communications, and recovery requirements are established; NASA and the DOD provide the capability to meet them. NASA is also responsible for the specialized training and equipment needed to meet these requirements. A Shuttle launch a KSC requires an Emergency Medical Services (EMS) coordinator on console to facilitate communications, ensure proper coverage, and coordinate with area hospitals. A contingent of NASA medical personnel are assembled to provide triage and medical support capabilities. The DOD provides medical evacuation (MEDEVAC) helicopters with surgeons and pararescue specialists (PJ's) or emergency medical technicians (EMT's). Each helicopter is equipped with at least one doctor and one PJ/EMT per astronaut crew member. Transoceanic abort landing (TAL) sites and end of mission (EOM) sites have similar structures, with TAL sites utilizing fixed wingg aircraft for MEDEVAC. The DOD also supports contingency planning for the support and return of crew members from the Space Station Freedom. Much of this support has been directed at the recovery of crew members following the landing of an Assured Crew Return Vehicle. Derived from text

N94-33645*# Army Inst. of Dental Research, Fort Meade, MD.
QUANTITATIVE 3-D IMAGING TOPOGRAMMETRY FOR TELEMEDICINE APPLICATIONS Abstract Only **c52**
Bruce R. Altschuler *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 553 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

The technology to reliably transmit high-resolution visual imagery over short to medium distances in real time has led to the serious considerations of the use of telemedicine, telepresence, and telerobotics in the delivery of health care. These concepts may involve, and evolve toward: consultation from remote expert teaching centers; diagnosis; triage; real-time remote advice to the surgeon; and real-time remote surgical instrument manipulation (telerobotics with virtual reality). Further extrapolation leads to teledesign and telereplication of spare surgical parts through quantitative teleimaging of 3-D surfaces tied to CAD/CAM devices and an artificially intelligent archival data base of 'normal' shapes. The ability to generate 'topogrames' or 3-D surface numerical tables of coordinate values capable of creating computer-generated virtual holographic-like displays, machine part replication, and statistical diagnostic shape assessment is critical to the progression of telemedicine. Any virtual reality simulation will remain in 'video-game' realm until realistic dimensional and spatial relational inputs from real measurements in vivo during surgeries are added to an ever-growing statistical data archive. The challenges of managing and interpreting this 3-D data base, which would include radiographic and surface quantitative data, are considerable. As technology drives toward dynamic and continuous 3-D surface measurements, presenting millions of X, Y, Z data points per second of flexing, stretching, moving human organs, the knowledge base and interpretive capabilities of 'brilliant robots' to work as a surgeon's tireless assistants becomes imaginable. The brilliant robot would 'see' what the surgeon sees--and more, for the robot could quantify its 3-D sensing and would 'see' in a wider spectral range than humans, and could zoom its 'eyes' from the macro world to long-distance microscopy. Unerring robot hands could rapidly perform machine-aided suturing with precision micro-sewing machines, splice neural connections with laser welds, micro-bore through constricted vessels, and computer combine ultrasound, microradiography, and 3-D mini-borescopes to quickly assess and trace vascular problems in situ. The spatial relationships between organs, robotic arms, and end-effector diagnostic, manipulative, and surgical instruments would be constantly monitored by the robot 'brain' using inputs from its multiple 3-D quantitative 'eyes' remote sensing, as well as by contact and proximity force measuring devices. Methods to create accurate and quantitative 3-D topograms at continuous video data rates are described. Author (revised)

N94-33646*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
IMIS: AN INTELLIGENCE MICROSCOPE IMAGING SYSTEM Abstract Only **c63**
Michael Caputo (Krug Life Sciences, Inc., Houston, TX.), Norwood Hunter (Krug Life Sciences, Inc., Houston, TX.), and Gerald Taylor *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 554 (For primary document see N94-33612 10-99)
Avail: CASI HC A01/MF A03

Until recently microscope users in space relied on traditional microscopy techniques that required manual operation of the microscope and recording of observations in the form of written notes, drawings, or photographs. This method was time consuming and required the return of film and drawings from space for analysis. No real-time data analysis was possible. Advances in digital and video technologies along with recent developments in article intelligence will allow future space microscopists to have a choice of three additional modes of microscopy: remote coaching, remote control, and automation. Remote coaching requires manual operations of the microscope with instructions given by two-way audio/video transmission during critical phases of the experiment. When using the remote mode of microscopy, the Principal Investigator controls the microscope from the ground. The automated mode employs artificial intelligence to control microscope functions and is the only mode that can be operated in the other three modes as well. The purpose of this presentation is to discuss the advantages and disadvantages of the four modes of of microscopy and how the IMIS, a proposed intelligent microscope imaging system, can be used as a model for developing and testing concepts, operating procedures, and equipment design of specifications required to provide a comprehensive microscopy/imaging capability onboard Space Station Freedom. Author

N94-33647*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

THE PORTABLE DYNAMIC FUNDUS INSTRUMENT: USES IN TELEMEDICINE AND RESEARCH Abstract Only **c52**

Norwood Hunter (Krug Life Sciences, Inc., Houston, TX.), Michael Caputo (Krug Life Sciences, Inc., Houston, TX.), Roger Billica, Gerald Taylor, C. Robert Gibson, F. Keith Manuel, Thomas Mader, and Richard Meehan *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 555-556 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

For years ophthalmic photographs have been used to track the progression of many ocular diseases such as macular degeneration and glaucoma as well as the ocular manifestations of diabetes, hypertension, and hypoxia. In 1987 a project was initiated at the Johnson Space Center (JSC) to develop a means of monitoring retinal vascular caliber and intracranial pressure during space flight. To conduct telemedicine during space flight operations, retinal images would require real-time transmissions from space. Film-based images would not be useful during in-flight operations. Video technology is beneficial in flight because the images may be acquired, recorded, and transmitted to the ground for rapid computer digital image processing and analysis. The computer analysis techniques developed for this project detected vessel caliber changes as small as 3 percent. In the field of telemedicine, the Portable Dynamic Fundus Instrument demonstrates the concept and utility of a small, self-contained video funduscope. It was used to record retinal images during the Gulf War and to transmit retinal images from the Space Shuttle Columbia during STS-50. There are plans to utilize this device to provide a mobile ophthalmic screening service in rural Texas. In the fall of 1993 a medical team in Boulder, Colorado, will transmit real-time images of the retina during remote consultation and diagnosis. The research applications of this device include the capability of operating in remote locations or small, confined test areas. There has been interest shown utilizing retinal imaging during high-G centrifuge tests, high-altitude chamber tests, and aircraft flight tests. A new design plan has been developed to incorporate the video instrumentation into face-mounted goggle. This design would eliminate head restraint devices, thus allowing full maneuverability to the subjects. Further development of software programs will broaden the application of the Portable Dynamic Fundus Instrument in telemedicine and medical research. Author

N94-33648*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TECHNICAL PARAMETERS FOR SPECIFYING IMAGERY REQUIREMENTS Abstract Only **c74**

Paul P. Coan and Sheri J. Dunnette *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 557 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

Providing visual information acquired from remote events to various operators, researchers, and practitioners has become progressively more important as the application of special skills in alien or hazardous situations increases. To provide an understanding of the technical parameters required to specify imagery, we have identified, defined, and discussed seven salient characteristics of images: spatial resolution, linearity, luminance resolution, spectral discrimination, temporal discrimination, edge definition, and signal-to-noise ratio. We then describe a generalizing imaging system and identified how various parts of the system affect the image data. To emphasize the different applications of imagery, we have constrasted the common television system with the significant parameters of a televisual imaging system for technical applications. Finally, we have established a method by which the required visual information can be specified by describing certain technical parameters which are directly related to the information content of the imagery. This method requires the user to complete a form listing all pertinent data requirements for the imagery. Author

N94-33649*# Aerospace Medical Research Labs., Brooks AFB, TX.

PERSONAL COOLING SYSTEMS: POSSIBILITIES AND LIMITATIONS Abstract Only **c54**

Sarah A. Nunneley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 559 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

Personal thermal control by means of gas- or liquid-conditioned garments was developed during the 1960s and has been applied in a variety of aerospace and industrial settings. Both USAF fighter pilots and astronauts are required to wear heavy protective clothing which insulates them from the environment and thus creates stress through storage of metabolic heat. The problem is particularly severe in astronauts who perform heavy physical work during extra-vehicular activity (EVA); without artificial cooling they could reach incapacitating hyperthermia in a matter of minutes. This paper reviews the factors which influence the design of personal cooling systems. An important early step is determination of acceptable heat stress level, taking into account possible interactions of heat stress with other physiological problems such as motion sickness, diminished plasma volume, decompression sickness and acceleration tolerance. Other factors which require consideration include the work schedule, the area to be covered by the cooling garment, and the practicalities of a fixed or body-mounted heat sink and its power source. Nearly every imaginable heat sink has been proposed or tried over the past 30 years, including direct gas systems, phase-change systems with open or closed loops and thermoelectric heat sinks. The latter are now the system of choice for aircraft. Author

N94-33650*# Army Research Inst. of Environmental Medicine, Natick, MA. Biophysics and Biomedical Modeling Div.

MODELING HEAT EXCHANGE CHARACTERISTICS OF LONG TERM SPACE OPERATIONS: ROLE OF SKIN WETTEDNESS AND EXERCISE **c54**

Richard R. Gonzalez *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 560-566 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

The problems of heat exchange during rest and exercise during long term space operations are covered in this report. Particular attention is given to the modeling and description of the consequences of requirement to exercise in a zero-g atmosphere during Space Shuttle flights, especially long term ones. In space environments, there exists no free convection therefore only forced convection occurring by movement, such as pedalling on a cycle ergometer, augments required heat dissipation necessary to regulate body temperature. The requirement to exercise at discrete periods of the day is good practice in order to resist the deleterious consequences of zero-gravity problems and improve distribution of body fluids. However, during exercise (ca. 180 to 250W), in zero-g environments, the mass of eccrine sweating rests as sheets on the skin surface and the sweat cannot evaporate readily. The use of exercise suits with fabrics that have hydrophobic or outwicking properties somewhat distributes the mass of sweat to a larger surface from which to evaporate. However, with no free convection, increased skin wettedness throughout the body surface induces increasing thermal discomfort, particularly during continuous exercise. This report presents several alternatives to aid in this problem: use of intermittent

exercise, methods to quantify local skin wettedness, and introduction of a new effective temperature that integrates thermal stress and heat exchange avenues in a zero-g atmosphere. Author

N94-33651*# Army Research Inst. of Environmental Medicine, Natick, MA. Environmental Physiology and Medical Directorate.

HYDRATION AND BLOOD VOLUME EFFECTS ON HUMAN THERMOREGULATION IN THE HEAT: SPACE APPLICATIONS c52

Michael N. Sawka, Richard R. Gonzalez, and Kent B. Pandolf *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 567-573 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

Astronauts exposed to prolonged weightlessness will experience deconditioning, dehydration, and hypovolemia which all adversely affect thermoregulation. These thermoregulatory problems can be minimized by several countermeasures that manipulate body water and vascular volumes. USARIEM scientists have extensively studied dehydration effects and several possible countermeasures including hyperhydration, plasma and erythrocyte volume expansion. This paper reviews USARIEM research into these areas. Author

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PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT WITH APPLICATION TO SPACE OPERATIONS c53

Kent B. Pandolf, Leander A. Stroschein, Richard R. Gonzalez, and Michael N. Sawka *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 574-581 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

This institute has developed a comprehensive USARIEM heat strain model for predicting physiological responses and soldier performance in the heat which has been programmed for use by hand-held calculators, personal computers, and incorporated into the development of a heat strain decision aid. This model deals directly with five major inputs: the clothing worn, the physical work intensity, the state of heat acclimation, the ambient environment (air temperature, relative humidity, wind speed, and solar load), and the accepted heat casualty level. In addition to predicting rectal temperature, heart rate, and sweat loss given the above inputs, our model predicts the expected physical work/rest cycle, the maximum safe physical work time, the estimated recovery time from maximal physical work, and the drinking water requirements associated with each of these situations. This model provides heat injury risk management guidance based on thermal strain predictions from the user specified environmental conditions, soldier characteristics, clothing worn, and the physical work intensity. If heat transfer values for space operations' clothing are known, NASA can use this prediction model to help avoid undue heat strain in astronauts during space flight. Author (revised)

N94-33653*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

EVALUATION OF A LIQUID COOLING GARMENT AS A COMPONENT OF THE LAUNCH AND ENTRY SUIT (LES) Abstract Only c54

J. Waligora, J. Charles, I. Fritsch, S. Fortney, S. Siconolfi, L. Pepper, L. Bagian, and V. Kumar *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 583 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

The LES is a partial pressure suit and a component of the shuttle life support system used during launch and reentry. The LES relies on gas ventilation with cabin air to provide cooling. There are conditions during nominal launch and reentry, landing, and post-landing phases when cabin temperature is elevated. Under these conditions, gas cooling may result in some discomfort and some decrement in orthostatic tolerance. There are emergency conditions involving loss of cabin ECS capability that would challenge crew thermal tolerance. The results of a series of tests are presented. These tests were conducted to assess the effectiveness of a liquid-cooled garment in alleviating thermal discomfort, orthostatic intolerance, and thermal intolerance during simulated mission phases. Author

N94-33654*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

LA CHALUPA-30: LESSONS LEARNED FROM A 30-DAY SUBSEA MISSION ANALOGUE c53

Steve VanderArk (Krug Life Sciences, Inc., Houston, TX.), JoAnna Wood (Krug Life Sciences, Inc., Houston, TX.), and Albert W. Holland *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 584-595 (For primary document see N94-33612 10-99)

Avail: CASI HC A03/MF A03

The Behavior and Performance Laboratory (BPL) utilizes space mission analogs to study issues such as the psychological health and well-being, team characteristics, and task performance of crew members on long-duration missions. The analog used in this investigation was an underwater habitat named La Chalupa, which was selected for its similar features to a space station environment. The primary objectives of the La Chalupa-30 investigation were to evaluate the efficiency of several methods for collecting data in remote environments and to assess aspects of living and working under isolated and confined conditions. Derived from text

N94-33655*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

COMPARATIVE PERFORMANCE OF A MODIFIED SPACE SHUTTLE REENTRY ANTI-G SUIT (REAGS) WITH AND WITHOUT PRESSURE SOCKS Abstract Only c54

R. W. Krutz, Jr. (Krug Life Sciences, Inc., Houston, TX.), G. L. Ripley (Krug Life Sciences, Inc., Houston, TX.), J. A. Marshall (Aerospace Medical Research Labs., Brooks AFB, TX.), and C. F. Sawin *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 596 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

In a prior study, the Armstrong Laboratory (AL) demonstrated that +G(sub z) protection during simulated shuttle reentry could be improved with an extended coverage anti-G suit with pressure socks but no abdominal bladder (REAGS). In a subsequent study conducted at the NASA Johnson Space Center it was shown that REAGS had a down side which included restricted mobility (during simulated shuttle egress) and a larger boot size needed for the pressure socks. The present study was conducted using a modified REAGS to increase mobility during egress. The size of the crotch opening was increased, and the fabric covering the buttocks was replaced with more elastic material. Six healthy male members of the AL centrifuge panel served as subjects for the study. As in the earlier study, subjects received 20 to 35 mg of IV Lasix approximately 6 hours before being exposed to a simulated space shuttle reentry +G(sub z) profile on the AL centrifuge, which induced a mean weight loss of 2.8 percent, range 2.1 percent to 3.7 percent. The REAGS was inflated to 1.0 psig 10 minutes prior to G onset. The G-profile was identical to that used in the previous REAGS study. Physiologic parameters monitored were also the same, i.e., eye-level systolic blood pressure (ELBP) using the Finapres digital cuff technique and heart rate and rhythm. Subjective comments were obtained from questionnaires administered after the increased G exposure. Systolic ELBP was maintained at 60 mm Hg or above by pressurizing the anti-G suit in 0.5 psig increments up to a maximum pressure of 2.5 psig. There were no significant differences in mean G-suit pressure required to maintain systolic ELBP at 60 mm Hg or above between the REAGS worn with and without pressure socks. Maximum mean G-levels achieved during the GOR were also the same under both experimental conditions, i.e., 4.7 G with socks and 4.6 G without socks. These G-levels were essentially the same as recorded earlier with the unmodified REAGS. There were no significant differences in comfort rating during the G exposure assigned by subjects when they wore the modified REAGS with or without the pressure socks. Author (revised)

N94-33656*# Aerospace Medical Research Labs., Brooks AFB, TX.

CURRENT AND FUTURE ISSUES IN USAF FULL PRESSURE SUIT RESEARCH AND DEVELOPMENT Abstract Only c54

Terrell E. Scoggins *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 597 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

Although the full pressure suits currently in the USAF operational inventory provide acceptable performance and crew protection for these missions, there is considerable room for improvement, especially in the areas of comfort, mobility, glove and helmet performance, and maintenance/supportability. As future aircraft push the envelope towards operations at higher and higher altitudes and transatmospheric flight, advances in full pressure suit technology will be needed. Also, enhanced pressure suit technology will be required to meet NASA's need for protection during future EVA operations for both on-orbit and planetary surface missions. This presentation will review the results of efforts at the Armstrong Laboratory to develop and demonstrate advanced full pressure suit technology for use in future high-altitude reconnaissance aircraft and transatmospheric vehicle operations. For those readers who may not be familiar with this area of life support equipment, a brief review of the important physiological and operational requirements for full pressure suits used in these applications will be addressed first, followed by a summary of the current state-of-the-art in USAF pressure suit technology. Ongoing and recently completed work on enhanced mobility pressure suit joints and improved pressure suit gloves will then be reviewed. The presentation will conclude with discussion of the technical challenges for successful development of an advanced full pressure suit for aerospace operations in the 21st century.

Author (revised)

N94-33657*# Naval Air Warfare Center, Warminster, PA.

ADVANCED INTEGRATED LIFE SUPPORT SYSTEM UPDATE Abstract Only **c54**

Phillip E. Whitley *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 598 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

The Advanced Integrated Life Support System Program (AILSS) is an advanced development effort to integrate the life support and protection requirements using the U.S. Navy's fighter/attack mission as a starting point. The goal of AILSS is to optimally mate protection from altitude, acceleration, chemical/biological agent, thermal environment (hot, cold, and cold water immersion) stress as well as mission enhancement through improved restraint, night vision, and head-mounted reticules and displays to ensure mission capability. The primary emphasis to date has been to establish garment design requirements and tradeoffs for protection. Here the garment and the human interface are treated as a system. Twelve state-off-the-art concepts from government and industry were evaluated for design versus performance. On the basis of a combination of centrifuge, thermal manikin data, thermal modeling, and mobility studies, some key design parameters have been determined. Future efforts will concentrate on the integration of protection through garment design and the use of a single layer, multiple function concept to streamline the garment system.

Author

N94-33658*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

CONTINUOUS MONITORING OF BACTERIAL ATTACHMENT Abstract Only **c51**

D. W. Koeing (Krug Life Sciences, Inc., Houston, TX.), S. K. Mishra (Krug Life Sciences, Inc., Houston, TX.), and D. L. Pierson *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 599 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

A major concern with the Space Station Freedom (SSF) water supply system is the control of longterm microbial contamination and biofilm development in the water storage and distribution systems. These biofilms have the potential for harboring pathogens as well as microbial strains containing resistance factors that could negatively influence crew health. The proposed means for disinfecting the water system on SSF (iodine) may encourage the selection of resistant strains. In fact, biofilm bacteria were observed in water lines from the Space Shuttle Columbia (OV-102); therefore, an alternative remediation method is required to disinfect spacecraft water lines. A thorough understanding of colonization events and the physiological parameters that will influence bacteria adhesion is required. The limiting factor for development of this technology is the ability to continuously monitor adhesion events and the effects of biocides on sessile bacteria. Methods were developed to allow bacterial adhesion and subsequent biocidal treatment to be monitored continuously. This technique couples automated image analysis with a continuous flow of a bacterial suspension through an optical flow cell. A strain of Pseudomonas cepacia isolated from the water supply of the Space Shuttle Discovery (OV-103) during STS-39 was grown in a nitrogen-limited continuous culture. This culture was challenged continuously with iodine during growth, and the adhesion characteristics of this strain was measure with regard to flow rate. Various biocides (ozone, hypochlorite, and iodine) were added to the flow stream to evaluate how well each chemical removed the bacteria. After biocide treatment, a fresh bacterial suspension was introduced into the flow cell, and the attachment rate was evaluated on the previously treated surface. This secondary fouling was again treated with biocide to determine the efficacy of multiple batch chemical treatments in removing biofilm.

Author (revised)

N94-33659*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

CHARACTERIZATION OF SPACECRAFT HUMIDITY CONDENSATE Abstract Only **c54**

Susan Muckle (Krug Life Sciences, Inc., Houston, TX.), John R. Schultz (Krug Life Sciences, Inc., Houston, TX.), and Richard L. Sauer *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 600 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

When construction of Space Station Freedom reaches the Permanent Manned Capability (PMC) stage, the Water Recovery and Management Subsystem will be fully operational such that (distilled) urine, spent hygiene water, and humidity condensate will be reclaimed to provide water of potable quality. The reclamation technologies currently baselined to process these waste waters include adsorption, ion exchange, catalytic oxidation, and disinfection. To ensure that the baseline technologies will be able to effectively remove those compounds presenting a health risk to the crew, the National Research Council has recommended that additional information be gathered on specific contaminants in waste waters representative of those to be encountered on the Space Station. With the application of new analytical methods and the analysis of waste water samples more representative of the Space Station environment, advances in the identification of the specific contaminants continue to be made. Efforts by the Water and Food Analytical Laboratory at JSC were successful in enlarging the database of contaminants in humidity condensate. These efforts have not only included the chemical characterization of condensate generated during ground-based studies, but most significantly the characterization of cabin and Spacelab condensate generated during Shuttle missions. The analytical results presented in this paper will be used to show how the composition of condensate varies amongst enclosed environments and thus the importance of collecting condensate from an environment close to that of the proposed Space Station. Although advances were made in the characterization of space condensate, complete characterization, particularly of the organics, requires further development of analytical methods.

Author (revised)

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COMPUTATION OF IODINE SPECIES CONCENTRATIONS IN WATER Abstract Only **c54**

John R. Schultz (Krug Life Sciences, Inc., Houston, TX.), Paul D. Mudgett (Krug Life Sciences, Inc., Houston, TX.), David T. Flanagan (Krug Life Sciences, Inc., Houston, TX.), and Richard L. Sauer *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 601 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

During an evaluation of the use of iodine as a water disinfectant and the development of methods for measuring various iodine species in water onboard Space Freedom, it became necessary to compute the concentration of the various species based on equilibrium principles alone. Of particular concern was the case when various amounts of iodine, iodide, strong acid, and strong base are added to water. Such solutions can be used to evaluate the performance of various monitoring methods being considered. The authors of this paper present an overview of aqueous iodine chemistry,

a set of nonlinear equations which can be used to model the above case, and a computer program for solving this system of equations using the Newton-Raphson method. The program was validated by comparing results over a range of concentrations and pH values with those previously presented by Gottardi for a given pH. Use of this program indicated that there are multiple roots to many cases and selecting an appropriate initial guess is important. Comparison of program results with laboratory results for the case when only iodine is added to water indicates the program gives high pH values for the iodine concentrations normally used for water disinfection. Extending the model to include the effects of iodate formation results in the computer pH values being closer to those observed, but the model with iodate does not agree well for the case in which base is added in addition to iodine to raise the pH. Potential explanations include failure to obtain equilibrium conditions in the lab, inaccuracies in published values for the equilibrium constants, and inadequate model of iodine chemistry and/or the lack of adequate analytical methods for measuring the various iodine species in water. Author (revised)

N94-33661*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A VOLATILE ORGANIC ANALYZER FOR SPACE STATION: DESCRIPTION AND EVALUATION OF A GAS CHROMATOGRAPHY/ION MOBILITY Abstract Only **c54**

Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.) and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 602 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

A Volatile Organic Analyzer (VOA) is being developed as an essential component of the Space Station's Environmental Health System (EHS) air quality monitoring strategy to provide warning to the crew and ground personnel if volatile organic compounds exceed established exposure limits. The short duration of most Shuttle flights and the relative simplicity of the contaminant removal mechanism have lessened the concern about crew exposure to air contaminants on the Shuttle. However, the longer missions associated with the Space Station, the complex air revitalization system and the proposed number of experiments have led to a desire for real-time monitoring of the contaminants in the Space Station atmosphere. Achieving the performance requirements established for the VOA within the Space Station resource (e.g., power, weight) allocations led to a novel approach that joined a gas chromatograph (GC) to an ion mobility spectrometer (IMS). The authors of this paper will discuss the rational for selecting the GC/IMS technology as opposed to the more established gas chromatography/mass spectrometry (GC/MS) for the foundation of the VOA. The data presented from preliminary evaluations will demonstrate the versatile capability of the GC/IMS to analyze the major contaminants expected in the Space Station atmosphere. The favorable GC/IMS characteristics illustrated in this paper included excellent sensitivity, dual-mode operation for selective detection, and mobility drift times to distinguish co-eluting GC peaks. Preliminary studies have shown that the GC/IMS technology can meet surpass the performance requirements of the Space Station VOA. Author (revised)

N94-33662*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SAFETY CONCERNS FOR FIRST ENTRY OPERATIONS OF ORBITING SPACECRAFT Abstract Only **c54**

Steven H. Wilson (Krug Life Sciences, Inc., Houston, TX.), Thomas F. Limero (Krug Life Sciences, Inc., Houston, TX.), and John T. James *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 603 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

The Space Station Freedom crew will face operational problems unique to the spacecraft environment due to the absence of convection currents and the confined atmosphere within the habitable modules. Airborne contaminants from the materials offgassing or contingency incidents like thermodegradation may accumulate until they reach hazardous concentrations. Flow modeling and experiences from previous space flight missions confirm that caution must be exercised during first-entry operations. A review of the first-entry procedures performed during the Skylab Program will be presented to highlight the necessity for carefully planned operations. Many of the environmental conditions that can be expected on the Space Station are analogous to those which exist in confined storage or work spaces in the industrial setting. Experience with closed-loop environmental operations (e.g., atmospheric control of submarines) have also demonstrated that the buildup of trace contaminant gases could result in conditions that lead to mission termination or loss of crew. Consequently, some first-entry issues for the Station can be addressed by comparing them to familiar techniques developed on Earth. The instruments of the Environmental Health System (EHS) will provide the necessary monitoring capability to protect crew health and safety during the planned first-entry procedures of the MTC phase of the SSF Program. The authors of this paper will describe those procedures and will cite an example of the consequences when proper first-entry procedures are not followed. Author (revised)

N94-33663*# McDonnell Aircraft Co., Saint Louis, MO.

UNIQUE METHODS FOR ON-ORBIT STRUCTURAL REPAIR, MAINTENANCE, AND ASSEMBLY **c54**

Ray Anderson and Phil Fuson *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 605-610 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

This paper reviews the MDA independent research and development (IRAD) efforts since 1986 in the development of two distinctly different approaches to on-orbit tube repair: (1) one-piece mechanical tube fittings that are forced, under pressure, onto the tube outer surface to effect the repair; and (2) electron beam weldings as demonstrated with the Paton-developed universal hand tool (UHT) space welding system for the repair of fluid lines and tubular components. Other areas of potential on-orbit repair using the UHT include damage to the flat or curved surfaces of habitation modules and truss assemblies. This paper will also address MDA evaluation of the Paton UHT system for on-orbit coating, cleaning, brazing, and cutting of metals. MDA development of an on-orbit compatible nondestructive evaluation (NDE) system for the inspection of tube welds is an important part of this complete space welding capability and will be discussed in a separate paper. Author

N94-33664*# McDonnell-Douglas Aerospace, Huntington Beach, CA.

ON-ORBIT NDE: A NOVEL APPROACH TO TUBE WELD INSPECTION **c37**

Kerry Michaels and Greg Hughes *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 611-618 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

The challenge of fabrication and repair of structures in space must be met if we are to utilize and maintain long-duration space facilities. Welding techniques have been demonstrated to provide the most reliable means to accomplish this task. Over the past few years, methods have been developed to perform orbital tube welding employing space-based welding technology pioneered by the former Soviet Union. Welding can result in the formation of defects, which threaten the structural integrity of the welded joint. Implementation of welding on-orbit, therefore, must also include methods to evaluate the quality and integrity of the welded joints. To achieve this goal, the development of an on-orbit tube weld inspection system, utilizing alternating current field measurement (ACFM) technology, has been under taken. This paper describes the development of the ACFM on-orbit tube weld inspection tool. Topics discussed include: requirements for on-orbit NDE, basic theory of ACFM, its advantages over other NDE methods for on-orbit applications, and the ACFM NDE system design. System operation and trial inspection results are also discussed. Future work with this technology is also considered. Author

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FORCE OVERRIDE RATE CONTROL FOR ROBOTIC MANIPULATORS **c37**

Morris Driels *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 619-627 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

The work reported deals with the problem of operating a robot manipulator

under a rate control mode while the end effector is not in contact with the external environment, and then switching to a force control mode when contact is made. The paper details how the modal changeover may be accomplished in a manner transparent to the operator, and will allow operator applied forces to be reflected at the robot end effector. A one degree of freedom demonstration system is used to illustrate the concept, which is then applied to a PUMA manipulator. Sample code for the implementation of the control is provided, experimental results show that the optimum setting for the gain is a function of the compliance of the end effector, and the compliance of the external constraint. Author

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GRAPHICAL PROGRAMMING: A SYSTEMS APPROACH FOR TELEROBOTIC SERVICING OF SPACE ASSETS **c37**

James T. Pinkerton, Michael J. McDonald, Robert D. Palmquist, and Richard Patten *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 629-640 See also N94-23201 (For primary document see N94-33612 10-99)

(Contract DE-AC04-76DP-00789)

Avail: CASI HC A03/MF A03

Satellite servicing is in many ways analogous to subsea robotic servicing in the late 1970's. A cost effective, reliable, telerobotic capability had to be demonstrated before the oil companies invested money in deep water robot serviceable production facilities. In the same sense, aeronautic engineers will not design satellites for telerobotic servicing until such a quantifiable capability has been demonstrated. New space servicing systems will be markedly different than existing space robot systems. Past space manipulator systems, including the Space Shuttle's robot arm, have used master/slave technologies with poor fidelity, slow operating speeds and most importantly, in-orbit human operators. In contrast, new systems will be capable of precision operations, conducted at higher rates of speed, and be commanded via ground-control communication links. Challenge presented by this environment include achieving a mandated level of robustness and dependability, radiation hardening, minimum weight and power consumption, and a system which accommodates the inherent communication delay between the ground station and the satellite. There is also a need for a user interface which is easy to use, ensures collision free motions, and is capable of adjusting to an unknown workcell (for repair operations the condition of the satellite may not be known in advance). This paper describes the novel technologies required to deliver such a capability. Author

N94-33667*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DIAGNOSING ANOMALIES OF SPACECRAFT FOR SPACE MAINTENANCE AND SERVICING **c18**

Michael Lauriente, Mark Rolincik, Harry C. Koons, and David Gorney *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 641-651 (For primary document see N94-33612 10-99)

Avail: CASI HC A03/MF A03

Very often servicing of satellites is necessary to replace components which are responsible for anomalous behavior of satellite operations due to adverse interactions with the natural space environment. A major difficulty with this diagnosis is that those responsible for diagnosing these anomalies do not have the tools to assess the role of the space environment causing the anomaly. To address this issue, we have under development a new rule-based, expert system for diagnosing spacecraft anomalies. The knowledge base consists of over two-hundred rules and provides links to historical and environmental databases. Environmental causes considered are bulk charging, single event upsets (SEU), surface charging, and total radiation dose. The system's driver translates forward chaining rules into a backward chaining sequence, prompting the user for information pertinent to the causes considered. When the user selects the novice mode, the system automatically gives detailed explanations and descriptions of terms and reasoning as the session progresses, in a sense teaching the user. As such it is an effective tutoring tool. The use of heuristics frees the user from searching through large amounts of irrelevant information and allows the user to input partial information (varying degrees of confidence in an answer) or 'unknown' to any question. The system is available on-line and uses C Language Integrated Production System (CLIPS), an expert shell developed by the NASA Johnson Space Center AI Laboratory in Houston. Author

N94-33668*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE SCRAM TOOL-KIT **c37**

David Tamir (Rockwell International Corp., Cocoa Beach, FL.), Lee A. Flanigan (Rockwell International Corp., Huntsville, AL.), Jack L. Weeks (Rockwell International Corp., Huntsville, AL.), Thomas A. Siewert (National Inst. of Standards and Technology, Boulder, CO.), Andrew G. Kimbrough (Dimetrics, Inc., Davidson, NC.), and Sidney R. McClure *In* NASA. Johnson Space Center, Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 652-660 (For primary document see N94-33612 10-99)

Avail: CASI HC A02/MF A03

This paper proposes a new series of on-orbit capabilities to support the near-term Hubble Space Telescope, Extended Duration Orbiter, Long Duration Orbiter, Space Station Freedom, other orbital platforms, and even the future manned Lunar/Mars missions. These proposed capabilities form a toolkit termed Space Construction, Repair, and Maintenance (SCRAM). SCRAM addresses both intra-Vehicular Activity (IVA) and Extra-Vehicular Activity (EVA) needs. SCRAM provides a variety of tools which enable welding, brazing, cutting, coating, heating, and cleaning, as well as corresponding nondestructive examination. Near-term IVA-SCRAM applications include repair and modification to fluid lines, structure, and laboratory equipment inside a shirt-sleeve environment (i.e. inside Spacelab or Space Station). Near-term EVA-SCRAM applications include construction of fluid lines and structural members, repair of punctures by orbital debris, refurbishment of surfaces eroded by contaminants. The SCRAM tool-kit also promises future EVA applications involving mass production tasks automated by robotics and artificial intelligence, for construction of large truss, aerobrake, and nuclear reactor shadow shields structures. The leading candidate tool processes for SCRAM, currently undergoing research and development, include Electron Beam, Gas Tungsten Arc, Plasma Arc, and Laser Beam. A series of strategic space flight experiments would make SCRAM available to help conquer the space frontier. Author

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SPACEHAB 1 MAINTENANCE EXPERIMENT **c18**

Jackie W. Bohannon *In its* Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 2 Jan. 1994 p 661-665 (For primary document see N94-33612 10-99)

Avail: CASI HC A01/MF A03

The SpaceHab 1 flight on STS-57 served as a test platform for evaluation of two space station payloads. The first payload evaluated a space station maintenance concept using a sweep signal generator and a 48-channel logic analyzer to perform fault detection and isolation. Crew procedures files, test setup diagram files, and software to configure the test equipment were created on the ground and uplinked on the astronauts' voice communication circuit to perform tests in flight. In order to use these files, the portable computer was operated in a multi-window configuration. The test data transmitted to the ground allowing the ground staff to identify the cause of the fault and provide the crew with the repair procedures and diagrams. The crew successfully repaired the system under test. The second payload investigated hand soldering and de-soldering of standard components on printed circuit (PC) boards in zero gravity. It also used a new type of intra-vehicular foot restraints which uses the neutral body posture in zero-g to provide retention of the crew without their conscious attention. Author

N94-33789* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ASTRONAUTS PART 5: ASTRONAUT COLLINS (Videotape)

11 Jan. 1989 Videotape: 28 min. 57 sec. playing time, in color, with sound

(NASA-TM-109842; NONP-VT-94-13532) Avail: CASI VHS A01/BETA A22

This video is an interview with Michael Collins about his accomplishments, NASA's accomplishments, and the future. LeRC

N94-33949*# National Aeronautics and Space Administration, Washington, DC.

NASA HISTORICAL DATA BOOK. VOLUME 4: NASA RESOURCES 1969-1978

Ihor Y. Gawdiak and Helen Fedor 1994 441 p NASA History Series (NASA-SP-4012-Vol-4; NAS 1.21:4012-Vol-4) Avail: CASI HC A03/MF A03

This is Volume 4, NASA Resources 1969-1978, of a series providing a 20-year statistical summary of NASA programs. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. This volume combines statistical data of the component facilities with the data of the parent installation. CASI

N94-34019*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SEVENTH ANNUAL WORKSHOP ON SPACE OPERATIONS APPLICATIONS AND RESEARCH (SOAR 1993), VOLUME 1

Kumar Krishen, ed. Jan. 1994 477 p Workshop held in Houston, TX, 3-5 Aug. 1993; sponsored by NASA, Washington and AF (NASA-CP-3240-Vol-1; S-749-Vol-1; NAS 1.55:3240-Vol-1) Avail: CASI HC A21/MF A04

This document contains papers presented at the Space Operations, Applications and Research Symposium (SOAR) Symposium hosted by NASA/Johnson Space Center (JSC) on August 3-5, 1993, and held at JSC Gilruth Recreation Center. SOAR included NASA and USAF programmatic overview, plenary session, panel discussions, panel sessions, and exhibits. It invited technical papers in support of U.S. Army, U.S. Navy, Department of Energy, NASA, and USAF programs in the following areas: robotics and telepresence, automation and intelligent systems, human factors, life support, and space maintenance and servicing. SOAR was concerned with Government-sponsored research and development relevant to aerospace operations. More than 100 technical papers, 17 exhibits, a plenary session, several panel discussions, and several keynote speeches were included in SOAR '93. For individual titles, see N94-34020 through N94-34062.

N94-34020*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.

MICROROVER RESEARCH AT JPL Abstract Only c37

Brian Wilcox *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 1 (For primary document see N94-34019 10-99)

Avail: CASI HC A01/MF A04

Planetary exploration with microrovers can be extended beyond the baseline short-range capability proposed for the Mars Environmental Survey (MESUR) microrover mission. The useful range of the microrover can be increased by using local landmarks to accurately reach desired science sites with a minimal number of Earth commands. Furthermore, onboard processing can give indications of excessive sinkage or slippage, which comprise hazards which may not be detectable from imaging, as well as to improve dead reckoning performance. Lastly, it is important to estimate the mean and variance of mission parameters such as time-to-reach-goal, energy-to-reach-goal, and likelihood-of-finding landmark. The author of the paper discusses research focused on accomplishing these objectives. Author

N94-34021*# Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.

DESIGN OF THE MESUR/PATHFINDER MICROROVER Abstract Only c37

Henry W. Stone *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 2 (For primary document see N94-34019 10-99)

Avail: CASI HC A01/MF A04

The use of unmanned robotic vehicles to assist in the exploration of Mars and other planets has been of interest to the National Aeronautics and Space Administration (NASA) for several decades and has been the focus of an ongoing research program at the Jet Propulsion Laboratory (JPL) for a similar period of time. As a result of these research activities, JPL is in the process of designing and building a small (7-9 kg) microrover to be flown aboard the Mars Environmental Survey Mission (MESUR)/Pathfinder spacecraft, which is tentatively to be launched to Mars in late 1997. The microrover will perform a variety of technology experiments designed to provide information critical to the design of future planetary rovers. In addition, the microrover will perform several science and lander related experiments using specialized onboard instruments. To enable the microrover to perform these experiments at selected target areas and at the same time deal with the long time delays (and limited communications bandwidth), a control/navigation approach combining the use of operator-designated waypoints and onboard behavior control has been adopted. The design of the MESUR/Pathfinder microrover and the overall manner in which it is controlled are described herein. Author

N94-34022*# Air Force Systems Command, Tyndall AFB, FL.

AIR FORCE CONSTRUCTION AUTOMATION/ROBOTICS Abstract Only c37

Al Nease and Christopher Dusseault *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 3 (For primary document see N94-34019 10-99)

Avail: CASI HC A01/MF A04

The Air Force has several unique requirements that are being met through the development of construction robotic technology. The missions associated with these requirements place construction/repair equipment operators in potentially harmful situations. Additionally, force reductions require that human resources be leveraged to the maximum extent possible and that more stringent construction repair requirements push for increased automation. To solve these problems, the U.S. Air Force is undertaking a research and development effort at Tyndall AFB, FL to develop robotic teleoperation, telerobotics, robotic vehicle communications, automated damage assessment, vehicle navigation, mission/vehicle task control architecture, and associated computing environment. The ultimate goal is the fielding of robotic repair capability operating at the level of supervised autonomy. The authors of this paper will discuss current and planned efforts in construction/repair, explosive ordnance disposal, hazardous waste cleanup, fire fighting, and space construction. Author

N94-34023*# Sandia National Labs., Albuquerque, NM. Advanced Vehicle Development Dept.

LUNAR EXPLORATION ROVER PROGRAM DEVELOPMENTS c37

P. R. Klarer *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 4-11 See also N94-23469 (For primary document see N94-34019 10-99)

Avail: CASI HC A02/MF A04

The Robotic All Terrain Lunar Exploration Rover (RATLER) design concept began at Sandia National Laboratories in late 1991 with a series of small, proof-of-principle, working scale models. The models proved the viability of the concept for high mobility through mechanical simplicity, and eventually received internal funding at Sandia National Laboratories for full scale, proof-of-concept prototype development. Whereas the proof-of-principle models demonstrated the mechanical design's capabilities for mobility, the full scale proof-of-concept design currently under development is intended to support field operations for experiments in telerobotics, autonomous robotic operations, telerobotic field geology, and advanced man-machine interface concepts. The development program's current status is described, including an outline of the program's work over the past year, recent accomplishments, and plans for follow-on development work. Author

N94-34024*# Houston Univ., TX.

SHARED VIRTUAL ENVIRONMENTS FOR AEROSPACE TRAINING Abstract Only c53

R. Bowen Loftin and Mark Voss *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 49 (For primary document see N94-34019 10-99)

Avail: CASI HC A01/MF A04

Virtual environments have the potential to significantly enhance the training of NASA astronauts and ground-based personnel for a variety of activities. A critical requirement is the need to share virtual environments,

in real or near real time, between remote sites. It has been hypothesized that the training of international astronaut crews could be done more cheaply and effectively by utilizing such shared virtual environments in the early stages of mission preparation. The Software Technology Branch at NASA's Johnson Space Center has developed the capability for multiple users to simultaneously share the same virtual environment. Each user generates the graphics needed to create the virtual environment. All changes of object position and state are communicated to all users so that each virtual environment maintains its 'currency.' Examples of these shared environments will be discussed and plans for the utilization of the Department of Defense's Distributed Interactive Simulation (DIS) protocols for shared virtual environments will be presented. Finally, the impact of this technology on training and education in general will be explored. Author

N94-34025*# Dartmouth-Hitchcock Medical Center, Lebanon, NH.
SURGERY APPLICATIONS OF VIRTUAL REALITY Abstract Only c52
Joseph Rosen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 50 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

Virtual reality is a computer-generated technology which allows information to be displayed in a simulated, bus lifelike, environment. In this simulated 'world', users can move and interact as if they were actually a part of that world. This new technology will be useful in many different fields, including the field of surgery. Virtual reality systems can be used to teach surgical anatomy, diagnose surgical problems, plan operations, simulate and perform surgical procedures (telesurgery), and predict the outcomes of surgery. The authors of this paper describe the basic components of a virtual reality surgical system. These components include: the virtual world, the virtual tools, the anatomical model, the software platform, the host computer, the interface, and the head-coupled display. In the chapter they also review the progress towards using virtual reality for surgical training, planning, telesurgery, and predicting outcomes. Finally, the authors present a training system being developed for the practice of new procedures in abdominal surgery. Author

N94-34026*# George Washington Univ., Washington, DC. Dept. of Electrical Engineering and Computer Science.
A STUDY OF NAVIGATION IN VIRTUAL SPACE c04
Rudy Darken, John L. Sibert, and Randy Shumaker *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 51-60 (For primary document see N94-34019 10-99)
(Contract N00014-91-K-2031)
Avail: CASI HC A02/MF A04

In the physical world, man has developed efficient methods for navigation and orientation. These methods are dependent on the high-fidelity stimuli presented by the environment. When placed in a virtual world which cannot offer stimuli of the same quality due to computing constraints and immature technology, tasks requiring the maintenance of position and orientation knowledge become laborious. In this paper, we present a representative set of techniques based on principles of navigation derived from real world analogs including human and avian navigation behavior and cartography. A preliminary classification of virtual worlds is presented based on the size of the world, the density of objects in the world, and the level of activity taking place in the world. We also summarize an informal study we performed to determine how the tools influenced the subjects' navigation strategies and behavior. We conclude that principles extracted from real world navigation aids such as maps can be seen to apply in virtual environments. Author

N94-34027*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ROBOLAB AND VIRTUAL ENVIRONMENTS c18
Joseph C. Giarratano *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 61-68 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

A useful adjunct to the manned space station would be a self-contained free-flying laboratory (RoboLab). This laboratory would have a robot operated under telepresence from the space station or ground. Long duration experiments aboard RoboLab could be performed by astronauts or scientists using telepresence to operate equipment and perform experiments. Operating the lab by telepresence would eliminate the need for life support such as food, water and air. The robot would be capable of motion in three dimensions, have binocular vision TV cameras, and two arms with manipulators to simulate hands. The robot would move along a two-dimensional grid and have a rotating, telescoping periscope section for extension in the third dimension. The remote operator would wear a virtual reality type headset to allow the superposition of computer displays over the real-time video of the lab. The operators would wear exoskeleton type arms to facilitate the movement of objects and equipment operation. The combination of video displays, motion, and the exoskeleton arms would provide a high degree of telepresence, especially for novice users such as scientists doing short-term experiments. The RoboLab could be resupplied and samples removed on other space shuttle flights. A self-contained RoboLab module would be designed to fit within the cargo bay of the space shuttle. Different modules could be designed for specific applications, i.e., crystal-growing, medicine, life sciences, chemistry, etc. This paper describes a RoboLab simulation using virtual reality (VR). VR provides an ideal simulation of telepresence before the actual robot and laboratory modules are constructed. The easy simulation of different telepresence designs will produce a highly optimum design before construction rather than the more expensive and time consuming hardware changes afterwards. Author

N94-34028*# Oak Ridge National Lab., TN.
DEVELOPMENT AND DEMONSTRATION OF A TELEROBOTIC EXCAVATION SYSTEM c37
Barry L. Burks, David H. Thompson, Stephen M. Killough, and Marion A. Dinkins *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 70-74 (For primary document see N94-34019 10-99)
(Contract DE-AC05-84OR-21400)
Avail: CASI HC A01/MF A04

Oak Ridge National Laboratory is developing remote excavation technologies for the Department of Energy's Office (DOE) of Technology Development, Robotics Technology Development Program, and also for the Department of Defense (DOD) Project Manager for Ammunition Logistics. This work is being done to meet the need for remote excavation and removal of radioactive and contaminated buried waste at several DOE sites and unexploded ordnance at DOD sites. System requirements are based on the need to uncover and remove waste from burial sites in a way that does not cause unnecessary personnel exposure or additional environmental contamination. Goals for the current project are to demonstrate dexterous control of a backhoe with force feedback and to implement robotic operations that will improve productivity. The Telerobotic Small Emplacement Excavator is a prototype system that incorporates the needed robotic and telerobotic capabilities on a commercially available platform. The ability to add remote dexterous teleoperation and robotic operating modes is intended to be adaptable to other commercially available excavator systems. Author

N94-34029*# Pacific Northwest Lab., Richland, WA. Automation and Measurement Sciences Dept.
A TELEOPERATED SYSTEM FOR REMOTE SITE CHARACTERIZATION c37
Gerald A. Sandness, Bradley S. Richardson, and Jon Pence *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 75-84 (For primary document see N94-34019 10-99)
(Contracts DE-AC06-76RL-01830; DE-AC05-85OR-21400; W-7405-eng-48)
Avail: CASI HC A02/MF A04

The detection and characterization of buried objects and materials is an important step in the restoration of burial sites containing chemical and radioactive waste materials at Department of Energy (DOE) and Department of Defense (DOD) facilities. By performing these tasks with remotely controlled sensors, it is possible to obtain improved data quality and consistency as well as enhanced safety for on-site workers. Therefore, the DOE Office of Technology Development and the US Army Environmental Center have jointly supported the development of the Remote Characterization System (RCS). One of the main components of the RCS is a small remotely driven survey vehicle that can transport various

combinations of geophysical and radiological sensors. Currently implemented sensors include ground-penetrating radar, magnetometers, an electromagnetic induction sensor, and a sodium iodide radiation detector. The survey vehicle was constructed predominantly of non-metallic materials to minimize its effect on the operation of its geophysical sensors. The system operator controls the vehicle from a remote, truck-mounted, base station. Video images are transmitted to the base station by a radio link to give the operator necessary visual information. Vehicle control commands, tracking information, and sensor data are transmitted between the survey vehicle and the base station by means of a radio ethernet link. Precise vehicle tracking coordinates are provided by a differential Global Positioning System (GPS). Author

N94-34030*# Sandia National Labs., Albuquerque, NM.
VEHICLE DEVELOPMENT OF LUNAR/MARS EXPLORATION Abstract Only c37
James W. Purvis *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 85 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

The author of this paper presents a historical discussion of robotic vehicle development of lunar and Martian exploration. The discussion begins by comparing and contrasting the transportation, environmental, and operational requirements of the two planets. This is followed by a historical summary of what has been done to date, including some recently released information on the Soviet rovers sent to Mars and Phobos in the early 1970s. Finally, current proposed missions, vehicles, operational requirements, and development status are discussed. Author

N94-34031*# TeleRobotics International, Inc., Knoxville, TN.
CONTROLLING TELEROBOTS WITH VIDEO DATA AND COMPENSATING FOR TIME-DELAYED VIDEO USING OMNIVIEW c63
Dan Kuban, Steve Zimmerman, and Lee Martin *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 86-93 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

Remote viewing is critical for teleoperations, but the inherent limitations of standard video reduce the operator's effectiveness. These limitations have been compensated for in many ways, from using the operator's adaptability, to augmenting his capability with feedback from a variety of sensors and simulations. Omniview can overcome some of these limitations and improve the operator's efficiency without adding additional sensors or computational burden. It can minimize the potential collisions with facility equipment, provide peripheral vision, and display multiple images simultaneously from a single input device. The Omniview technology provides electronic pan, tilt, magnify, and rotational orientation within a hemispherical field-of-view without any moving parts. Image sizes, viewing directions, scale, offset, etc., may be adjusted to fit operator needs. This paper discusses the derivation of the image transformation, the design of the electronics, and two applications to telepresence that are under development. These are Video Emulated Tweening (VET), and Manipulator Guidance and Positioning (ManGAP). The VET effort uses Omniview to compensate for time-delayed video in teleoperation of remote vehicles. In ManGAP two Omniview systems are used to provide two sets of orientation vectors to points in the field-of-view (FOV). These vectors then provide absolute position information to both control the position of the telerobot, and to avoid collisions with the work sight equipment. Author

N94-34032*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DEXTEROUS END EFFECTOR FLIGHT DEMONSTRATION c37
Edward L. Carter (Lockheed Engineering and Sciences Co., Houston, TX.) and Leo G. Monford *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 95-102 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

The Dexterous End Effector Flight Experiment is a flight demonstration of newly developed equipment and methods which make for more dexterous manipulation of robotic arms. The following concepts are to be demonstrated: The Force Torque Sensor is a six axis load cell located at the end of the RMS which displays load data to the operator on the orbiter CCTV monitor. TRAC is a target system which provides six axis positional information to the operator. It has the characteristic of having high sensitivity to attitude misalignment while being flat. AUTO-TRAC is a variation of TRAC in which a computer analyzes a target, displays translational and attitude misalignment information, and provides cues to the operator for corrective inputs. The Magnetic End Effector is a fault tolerant end effector which grapples payloads using magnetic attraction. The Carrier Latch Assembly is a fault tolerant payload carrier, which uses mechanical latches and/or magnetic attraction to hold small payloads during launch/landing and to release payloads as desired. The flight experiment goals and objectives are explained. The experiment equipment is described, and the tasks to be performed during the demonstration are discussed. Author

N94-34033*# Oceaneering Space Systems, Webster, TX.
UNDERSEA APPLICATIONS OF DEXTEROUS ROBOTICS Abstract Only c37
Mark M. Gittleman *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 103-111 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

The revolution and application of dexterous robotics in the undersea energy production industry and how this mature technology has affected planned SSF dexterous robotic tasks are examined. Undersea telerobotics, or Remotely Operated Vehicles (ROV's), have evolved in design and use since the mid-1970s. Originally developed to replace commercial divers for both planned and unplanned tasks, they are now most commonly used to perform planned robotic tasks in all phases of assembly, inspection, and maintenance of undersea structures and installations. To accomplish these tasks, the worksites, the tasks themselves, and the tools are now engineered with both the telerobot's and the diver's capabilities in mind. In many cases, this planning has permitted a reduction in telerobot system complexity and cost. The philosophies and design practices that have resulted in the successful incorporation of telerobotics into the highly competitive and cost conscious offshore production industry have been largely ignored in the space community. Cases where these philosophies have been adopted or may be successfully adopted in the near future are explored. Author

N94-34034*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ROBOTIC TECHNOLOGIES OF THE FLIGHT TELEROBOTIC SERVICER (FTS) INCLUDING FAULT TOLERANCE c37
John T. Chladek and William M. Craver *In its* The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 112-120 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

The original FTS concept for Space Station Freedom (SSF) was to provide telerobotic assistance to enhance crew activity and safety and to reduce crew EVA (Extra Vehicular Activity) activity. The first flight of the FTS manipulator systems would demonstrate several candidate tasks and would verify manipulator performance parameters. These first flight tasks included unlocking a SSF Truss Joint, mating/demating a fluid coupling, contact following of a contour board, demonstrating peg-in-hole assembly, and grasping and moving a mass. Future tasks foreseen for the FTS system included ORU (Orbit Replaceable Unit) change-out, Hubble Space Telescope Servicing, Gamma Ray Observatory refueling, and several in-situ SSF servicing and maintenance tasks. Operation of the FTS was planned to evolve from teleoperation to fully autonomous execution of many tasks. This wide range of mission tasks combined with the desire to evolve toward fully autonomy forced several requirements which may seen extremely demanding to the telerobotics community. The FTS requirements appear to have been created to accommodate the open-ended evolution plan such that operational evolution would not be impeded by function limitations. A recommendation arising from the FTS program to remedy the possible impacts from such ambitious requirements is to analyze candidate robotic tasks. Based on these task analyses, operational impacts against development impacts were weighed prior to requirements definition. Many of the FTS requirements discussed in the following sections greatly influenced the development cost and schedule of the FTS manipulator.

The FTS manipulator has been assembled at Martin Marietta and is currently in testing. Successful component tests indicate a manipulator which achieves unprecedented performance specifications. Author

N94-34035*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

EVA-SCRAM OPERATIONS c54

Lee A. Flanigan (Rockwell International Corp., Huntsville, AL.), David Tamir (Rockwell International Corp., Cocoa Beach, FL.), Jack L. Weeks (Rockwell International Corp., Huntsville, AL.), Sidney R. McClure, and Andrew G. Kimbrough *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 121-129 (For primary document see N94-34019 10-99)

Avail: CASI HC A02/MF A04

This paper wrestles with the on-orbit operational challenges introduced by the proposed Space Construction, Repair, and Maintenance (SCRAM) tool kit for Extra-Vehicular Activity (EVA). SCRAM undertakes a new challenging series of on-orbit tasks in support of the near-term Hubble Space Telescope, Extended Duration Orbiter, Long Duration Orbiter, Space Station Freedom, other orbital platforms, and even the future manned Lunar/Mars missions. These new EVA tasks involve welding, brazing, cutting, coating, heat-treating, and cleaning operations. Anticipated near-term EVA-SCRAM applications include construction of fluid lines and structural members, repair of punctures by orbital debris, refurbishment of surfaces eroded by atomic oxygen, and cleaning of optical, solar panel, and high emissivity radiator surfaces which have been degraded by contaminants. Future EVA-SCRAM applications are also examined, involving mass production tasks automated with robotics and artificial intelligence, for construction of large truss, aerobrake, and reactor shadow shield structures. Realistically achieving EVA-SCRAM is examined by addressing manual, teleoperated, semi-automated, and fully-automated operation modes. The operational challenges posed by EVA-SCRAM tasks are reviewed with respect to capabilities of existing and upcoming EVA systems, such as the Extravehicular Mobility Unit, the Shuttle Remote Manipulating System, the Dexterous End Effector, and the Servicing Aid Tool. Author

N94-34036*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

HARDWARE INTERFACE FOR ISOLATION OF VIBRATIONS IN FLEXIBLE MANIPULATORS: DEVELOPMENT AND APPLICATIONS c37

Davoud Manouchehri (Rockwell International Corp., Downey, CA.), Thomas Lindsay (Rockwell International Corp., Downey, CA.), and David Ghosh *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 130-136 (For primary document see N94-34019 10-99) (Contract NAS1-19243)

Avail: CASI HC A02/MF A04

NASA's Langley Research Center (LaRC) is addressing the problem of isolating the vibrations of the Shuttle remote manipulator system (RMS) from its end-effector and/or payload by modeling an RMS flat-floor simulator with a dynamic payload. Analysis of the model can lead to control techniques that will improve the speed, accuracy, and safety of the RMS in capturing satellites and eventually facilitate berthing with the space station. Rockwell International Corporation, also involved in vibration isolation, has developed a hardware interface unit to isolate the end-effector from the vibrations of an arm on a Shuttle robotic tile processing system (RTPS). To apply the RTPS isolation techniques to long-reach arms like the RMS, engineers have modeled the dynamics of the hardware interface unit with simulation software. By integrating the Rockwell interface model with the NASA LaRC RMS simulator model, investigators can study the use of a hardware interface to isolate dynamic payloads from the RMS. The interface unit uses both active and passive compliance and damping for vibration isolation. Thus equipped, the RMS could be used as a telemanipulator with control characteristics for capture and berthing operations. The hardware interface also has applications in industry. Author

N94-34037*# National Inst. of Standards and Technology, Gaithersburg, MD. Robot Systems Div.

GROUND VEHICLE CONTROL AT NIST: FROM TELEOPERATION TO AUTONOMY c63

Karl N. Murphy, Maris Juberts, Steven A. Legowik, Marilyn Nashman, Henry Schneiderman, Harry A. Scott, and Sandor Szabo *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 137-142 (For primary document see N94-34019 10-99)

Avail: CASI HC A02/MF A04

NIST is applying their Real-time Control System (RCS) methodology for control of ground vehicles for both the U.S. Army Researh Lab, as part of the DOD's Unmanned Ground Vehicles program, and for the Department of Transportation's Intelligent Vehicle/Highway Systems (IVHS) program. The actuated vehicle, a military HMMWV, has motors for steering, brake, throttle, etc. and sensors for the dashboard gauges. For military operations, the vehicle has two modes of operation: a teleoperation mode--where an operator remotely controls the vehicle over an RF communications network; and a semi-autonomous mode called retro-traverse--where the control system uses an inertial navigation system to steer the vehicle along a prerecorded path. For the IVHS work, intelligent vision processing elements replace the human teleoperator to achieve autonomous, visually guided road following. Author (revised)

N94-34038*# Army Research Lab., Aberdeen Proving Ground, MD.

INTELLIGENT VEHICLE CONTROL: OPPORTUNITIES FOR TERRESTRIAL-SPACE SYSTEM INTEGRATION Abstract Only c63

Charles Shoemaker *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 143 (For primary document see N94-34019 10-99)

Avail: CASI HC A01/MF A04

For 11 years the Department of Defense has cooperated with a diverse array of other Federal agencies including the National Institute of Standards and Technology, the Jet Propulsion Laboratory, and the Department of Energy, to develop robotics technology for unmanned ground systems. These activities have addressed control system architectures supporting sharing of tasks between the system operator and various automated subsystems, man-machine interfaces to intelligent vehicles systems, video compression supporting vehicle driving in low data rate digital communication environments, multiple simultaneous vehicle control by a single operator, path planning and retrace, and automated obstacle detection and avoidance subsystem. Performance metrics and test facilities for robotic vehicles were developed permitting objective performance assessment of a variety of operator-automated vehicle control regimes. Progress in these areas will be described in the context of robotic vehicle testbeds specifically developed for automated vehicle research. These initiatives, particularly as regards the data compression, task sharing, and automated mobility topics, also have relevance in the space environment. The intersection of technology development interests between these two communities will be discussed in this paper. Author (revised)

N94-34039*# Fairchild Space Co., Germantown, MD.

THE SERVICING AID TOOL: A TELEOPERATED ROBOTICS SYSTEM FOR SPACE APPLICATIONS c37

Keith W. Dorman, John L. Pullen, William O. Keksz, Paul H. Eismann, Keith A. Kowalski, and James P. Karlen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 144-155 (For primary document see N94-34019 10-99)

Avail: CASI HC A03/MF A04

The Servicing Aid Tool (SAT) is a teleoperated, force-reflecting manipulation system designed for use on the Space Shuttle. The system will assist Extravehicular Activity (EVA) servicing of spacecraft such as the Hubble Space Telescope. The SAT stands out from other robotics development programs in that special attention was given to provide a low-cost, space-qualified design which can easily and inexpensively be reconfigured and/or enhanced through the addition of existing NASA funded technology as that technology matures. SAT components are spaceflight adaptations of existing ground-based designs from Robotics Research Corporation (RRC), the leading supplier of robotics systems to the NASA and university research community in the United States. Fairchild Space is the prime contractor and provides the control electronics, safety system, system integration, and qualification testing. The manipulator consists of a 6-DOF Slave Arm mounted on a 1-DOF Positioning Link in the shuttle payload bay. The Slave Arm is controlled via a highly similar, 6-DOF, force-reflecting Master Arm from Schilling Development, Inc. This work is

being performed under contract to the Goddard Space Flight Center Code, Code 442, Hubble Space Telescope Flight Systems and Servicing Project.
Author (revised)

N94-34040*# Tooele Army Depot, UT.
ROBOTIC VEHICLE MOBILITY AND TASK PERFORMANCE: A FLEXIBLE CONTROL MODALITY FOR MANNED SYSTEMS Abstract only **c37**
Frederick Eldredge *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 156 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

In the early 1980's, a number of concepts were developed for applying robotics to ground systems. The majority of these early application concepts envisioned robotics technology embedded in dedicated unmanned systems; i.e., unmanned systems with no provision for direct manned control of the platform. Although these concepts offered advantages peculiar to platforms designed from the outset exclusively for unmanned operation--i.e., no crew compartment--their findings would require costs and support for a new class of unmanned systems. The current era of reduced budgets and increasing focus on rapid force projection has created new opportunities to examine the value of an alternative concept: the use of existing manned platforms with an ability to quickly shift from normal manned operation to unmanned should a particularly harzardous situation arise. The author of this paper addresses the evolution of robotic vehicle concepts and technology testbeds from exclusively unmanned systems to a variety of 'optionally manned' systems which have been designed with minimum intrusion actuator and control equipment to minimize degradation of vehicle performance in manned modes of operation. Author

N94-34041*# Stanford Univ., Palo Alto, CA. Knowledge Systems Lab.
THE STANFORD HOW THINGS WORK PROJECT **c82**
Richard Fikes, Tom Gruber, and Yumi Iwasaki *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 167-176 Sponsored by DARPA (For primary document see N94-34019 10-99)
(Contract NAG2-581; NCC2-537)
Avail: CASI HC A02/MF A04

We provide an overview of the Stanford How Things Work (HTW) project, an ongoing integrated collection of research activities in the Knowledge Systems Laboratory at Stanford University. The project is developing technology for representing knowledge about engineered devices in a form that enables the knowledge to be used in multiple systems for multiple reasoning tasks and reasoning methods that enable the represented knowledge to be effectively applied to the performance of the core engineering task of simulating and analyzing device behavior. The central new capabilities currently being developed in the project are automated assistance with model formulation and with verification that a design for an electro-mechanical device satisfies its functional specification. Author

N94-34042*# Teleos Research, Palo Alto, CA.
ACTING TO GAIN INFORMATION: REAL-TIME REASONING MEETS REAL-TIME PERCEPTION Abstract Only **c82**
Stan Rosenschein *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 177 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

Recent advances in intelligent reactive systems suggest new approaches to the problem of deriving task-relevant information from perceptual systems in real time. The author will describe work in progress aimed at coupling intelligent control mechanisms to real-time perception systems, with special emphasis on frame rate visual measurement systems. A model for integrated reasoning and perception will be discussed, and recent progress in applying these ideas to problems of sensor utilization for efficient recognition and tracking will be described. Author (revised)

N94-34043*# California Univ., Los Angeles, CA. Cognitive Systems Lab.
FROM CONDITIONAL OUGHTS TO QUALITATIVE DECISION THEORY **c63**
Judea Pearl *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 178-186 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

The primary theme of this investigation is a decision theoretic account of conditional ought statements (e.g., 'You ought to do A, if C') that rectifies glaring deficiencies in classical deontic logic. The resulting account forms a sound basis for qualitative decision theory, thus providing a framework for qualitative planning under uncertainty. In particular, we show that adding causal relationships (in the form of a single graph) as part of an epistemic state is sufficient to facilitate the analysis of action sequences, their consequences, their interaction with observations, their expected utilities, and the synthesis of plans and strategies under uncertainty.
Author (revised)

N94-34044*# California Univ., Irvine, CA. Department of Information and Computer Science.
FINDING ACCURATE FRONTIERS: A KNOWLEDGE-INTENSIVE APPROACH TO RELATIONAL LEARNING **c53**
Michael Pazzani and Clifford Brunk *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 187-193 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

An approach to analytic learning is described that searches for accurate entailments of a Horn Clause domain theory. A hill-climbing search, guided by an information based evaluation function, is performed by applying a set of operators that derive frontiers from domain theories. The analytic learning system is one component of a multi-strategy relational learning system. We compare the accuracy of concepts learned with this analytic strategy to concepts learned with an analytic strategy that operationalizes the domain theory. Author

N94-34045*# Oregon State Univ., Corvallis, OR. Dept. of Computer Science.
REINFORCEMENT LEARNING IN SCHEDULING **c53**
Tom G. Dietterich, DoKyeong Ok, Wei Zhang, and Prasad Tadepalli *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 194-199 (For primary document see N94-34019 10-99)
(Grant NAGw-1293)
Avail: CASI HC A02/MF A04

The goal of this research is to apply reinforcement learning methods to real-world problems like scheduling. In this preliminary paper, we show that learning to solve scheduling problems such as the Space Shuttle Payload Processing and the Automatic Guided Vehicle (AGV) scheduling can be usefully studied in the reinforcement learning framework. We discuss some of the special challenges posed by the scheduling domain to these methods and propose some possible solutions we plan to implement.
Author

N94-34046*# Carnegie-Mellon Univ., Pittsburgh, PA. The Robotics Institute.
CONSTRAINT-BASED INTEGRATION OF PLANNING AND SCHEDULING FOR SPACE-BASED OBSERVATORY MANAGEMENT **c81**
Nicola Muscettola and Steven F. Smith *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 200-206 (For primary document see N94-34019 10-99)
(Contracts NCC2-531; F30602-90-C-0119)
Avail: CASI HC A02/MF A04

Progress toward the development of effective, practical solutions to space-based observatory scheduling problems within the HSTS scheduling framework is reported. HSTS was developed and originally applied in the context of the Hubble Space Telescope (HST) short-term observation scheduling problem. The work was motivated by the limitations of the current solution and, more generally, by the insufficiency of classical planning and scheduling approaches in this problem context. HSTS has subsequently been used to develop improved heuristic solution techniques in related scheduling domains and is currently being applied to develop a scheduling tool for the upcoming Submillimeter Wave Astronomy Satellite (SWAS) mission. The salient architectural characteristics of HSTS and their

relationship to previous scheduling and AI planning research are summarized. Then, some key problem decomposition techniques underlying the integrated planning and scheduling approach to the HST problem are described; research results indicate that these techniques provide leverage in solving space-based observatory scheduling problems. Finally, more recently developed constraint-posting scheduling procedures and the current SWAS application focus are summarized. Derived from text

N94-34047*# Michigan Univ., Ann Arbor, MI. Artificial Intelligence Lab.
LEARNING PROCEDURES FROM INTERACTIVE NATURAL LANGUAGE INSTRUCTIONS **c61**
Scott B. Huffman and John E. Laird *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 207-216 (For primary document see N94-34019 10-99)
(Contract NCC2-517)
Avail: CASI HC A02/MF A04

Despite its ubiquity in human learning, very little work has been done in artificial intelligence on agents that learn from interactive natural language instructions. In this paper, the problem of learning procedures from interactive, situated instruction is examined in which the student is attempting to perform tasks within the instructional domain, and asks for instruction when it is needed. Presented is Instructo-Soar, a system that behaves and learns in response to interactive natural language instructions. Instructo-Soar learns completely new procedures from sequences of instruction, and also learns how to extend its knowledge of previously known procedures to new situations. These learning tasks require both inductive and analytic learning. Instructo-Soar exhibits a multiple execution learning process in which initial learning has a rote, episodic flavor, and later executions allow the initially learned knowledge to be generalized properly.
Author (revised)

N94-34048*# California Univ., Berkeley, CA.
FUZZY LOGIC, NEURAL NETWORKS, AND SOFT COMPUTING
Abstract Only **c63**
Lofti A. Zadeh *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 217 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

The past few years have witnessed a rapid growth of interest in a cluster of modes of modeling and computation which may be described collectively as soft computing. The distinguishing characteristic of soft computing is that its primary aims are to achieve tractability, robustness, low cost, and high MIQ (machine intelligence quotient) through an exploitation of the tolerance for imprecision and uncertainty. Thus, in soft computing what is usually sought is an approximate solution to a precisely formulated problem or, more typically, an approximate solution to an imprecisely formulated problem. A simple case in point is the problem of parking a car. Generally, humans can park a car rather easily because the final position of the car is not specified exactly. If it were specified to within, say, a few millimeters and a fraction of a degree, it would take hours or days of maneuvering and precise measurements of distance and angular position to solve the problem. What this simple example points to is the fact that, in general, high precision carries a high cost. The challenge, then, is to exploit the tolerance for imprecision by devising methods of computation which lead to an acceptable solution at low cost. By its nature, soft computing is much closer to human reasoning than the traditional modes of computation. At this juncture, the major components of soft computing are fuzzy logic (FL), neural network theory (NN), and probabilistic reasoning techniques (PR), including genetic algorithms, chaos theory, and part of learning theory. Increasingly, these techniques are used in combination to achieve significant improvement in performance and adaptability. Among the important application areas for soft computing are control systems, expert systems, data compression techniques, image processing, and decision support systems. It may be argued that it is soft computing, rather than the traditional hard computing, that should be viewed as the foundation for artificial intelligence. In the years ahead, this may well become a widely held position. Author

N94-34049*# Maryland Univ., College Park, MD. Dept. of Computer Science.
HYBRID KNOWLEDGE SYSTEMS **c82**
V. S. Subrahmanian *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 218-225 (For primary document see N94-34019 10-99)
(Contracts F49620-93-1-0065; DAAL03-92-G-0225)
Avail: CASI HC A02/MF A04

An architecture called hybrid knowledge system (HKS) is described that can be used to interoperate between a specification of the control laws describing a physical system, a collection of databases, knowledge bases and/or other data structures reflecting information about the world in which the physical system controlled resides, observations (e.g. sensor information) from the external world, and actions that must be taken in response to external observations. Author (revised)

N94-34050*# University of Southern California, Marina del Rey, CA. Dept. of Computer Science.
TWO FRAMEWORKS FOR INTEGRATING KNOWLEDGE IN INDUCTION **c82**
Paul S. Rosenbloom, Haym Hirsh, William W. Cohen, and Benjamin D. Smith *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 226-233 (For primary document see N94-34019 10-99)
(Contract NCC2-538)
Avail: CASI HC A02/MF A04

The use of knowledge in inductive learning is critical for improving the quality of the concept definitions generated, reducing the number of examples required in order to learn effective concept definitions, and reducing the computation needed to find good concept definitions. Relevant knowledge may come in many forms (such as examples, descriptions, advice, and constraints) and from many sources (such as books, teachers, databases, and scientific instruments). How to extract the relevant knowledge from this plethora of possibilities, and then to integrate it together so as to appropriately affect the induction process is perhaps the key issue at this point in inductive learning. Here the focus is on the integration part of this problem; that is, how induction algorithms can, and do, utilize a range of extracted knowledge. Preliminary work on a transformational framework for defining knowledge-intensive inductive algorithms out of relatively knowledge-free algorithms is described, as is a more tentative problems-space framework that attempts to cover all induction algorithms within a single general approach. These frameworks help to organize what is known about current knowledge-intensive induction algorithms, and to point towards new algorithms. Author (revised)

N94-34051*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
DISCOVERING OPERATING MODES IN TELEMETRY DATA FROM THE SHUTTLE REACTION CONTROL SYSTEM **c17**
Stefanos Manganaris (Vanderbilt Univ., Nashville, TN.), Doug Fisher (Vanderbilt Univ., Nashville, TN.), and Deepak Kulkarni *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 234-244 (For primary document see N94-34019 10-99)
(Contract NCC2-645)
Avail: CASI HC A03/MF A04

This paper addresses the problem of detecting and diagnosing faults in physical systems, for which suitable system models are not available. An architecture is proposed that integrates the on-line acquisition and exploitation of monitoring and diagnostic knowledge. The focus is on the component of the architecture that discovers classes of behaviors with similar characteristics by observing a system in operation. A characterization of behaviors based on best fitting approximation models is investigated. An experimental prototype has been implemented to test it. Preliminary results in diagnosing faults of the reaction control system of the space shuttle are presented. The merits and limitations of the approach are identified and directions for future work are set. Author (revised)

N94-34052*# Texas Univ., Austin, TX. Computer Science Dept.
SELF-CALIBRATING MODELS FOR DYNAMIC MONITORING AND DIAGNOSIS **c63**

Benjamin Kuipers *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 245-252 (For primary document see N94-34019 10-99)
(Contract NAG9-665; NCC2-760; NSF IRI-89-04454; NSF IRI-90-17047)
Avail: CASI HC A02/MF A04

The present goal in qualitative reasoning is to develop methods for automatically building qualitative and semiquantitative models of dynamic systems and to use them for monitoring and fault diagnosis. The qualitative approach to modeling provides a guarantee of coverage while our semiquantitative methods support convergence toward a numerical model as observations are accumulated. We have developed and applied methods for automatic creation of qualitative models, developed two methods for obtaining tractable results on problems that were previously intractable for qualitative simulation, and developed more powerful methods for learning semiquantitative models from observations and deriving semiquantitative predictions from them. With these advances, qualitative reasoning comes significantly closer to realizing its aims as a practical engineering method.
Author (revised)

N94-34053*# Pittsburgh Univ., PA. Dept. of Computer Science.
FILTERING AS A REASONING-CONTROL STRATEGY: AN EXPERIMENTAL ASSESSMENT **c63**
Martha E. Pollack *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 253-260 (For primary document see N94-34019 10-99)
(Contracts F49620-91-C-0005; F49620-92-J-0422; F30602-93-C-0038; NSF IRI-92-58392)
Avail: CASI HC A02/MF A04

In dynamic environments, optimal deliberation about what actions to perform is impossible. Instead, it is sometimes necessary to trade potential decision quality for decision timeliness. One approach to achieving this trade-off is to endow intelligent agents with meta-level strategies that provide them guidance about when to reason (and what to reason about) and when to act. We describe our investigations of a particular meta-level reasoning strategy, filtering, in which an agent commits to the goals it has already adopted, and then filters from consideration new options that would conflict with the successful completion of existing goals. To investigate the utility of filtering, a series of experiments was conducted using the Tileworld testbed. Previous experiments conducted by Kinny and Georgeff used an earlier version of the Tileworld to demonstrate the feasibility of filtering. Results are presented that replicate and extend those of Kinny and Georgeff and demonstrate some significant environmental influences on the value of filtering.
Author (revised)

N94-34054*# Wyoming Univ., Laramie, WY. Computer Science Dept.
TRANSLATION BETWEEN REPRESENTATION LANGUAGES **c61**
Jeffrey VanBaalen *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 261-267 (For primary document see N94-34019 10-99)
(Contracts NAG2-581; NCC2-537; F49620-92-J-0434; ARPA Order 8607)
Avail: CASI HC A02/MF A04

A capability for translating between representation languages is critical for effective knowledge base reuse. A translation technology for knowledge representation languages based on the use of an interlingua for communicating knowledge is described. The interlingua-based translation process consists of three major steps: translation from the source language into a subset of the interlingua, translation between subsets of the interlingua, and translation from a subset of the interlingua into the target language. The first translation step into the interlingua can typically be specified in the form of a grammar that describes how each top-level form in the source language translates into the interlingua. In cases where the source language does not have a declarative semantics, such a grammar is also a specification of a declarative semantics for the language. A methodology for building translators that is currently under development is described. A 'translator shell' based on this methodology is also under development. The shell has been used to build translators for multiple representation languages and those translators have successfully translated nontrivial knowledge bases.
Author (revised)

N94-34055*# Washington State Univ., Pullman, WA. School of Electrical Engineering and Computer Science.
A MACHINE-LEARNING APPRENTICE FOR THE COMPLETION OF REPETITIVE FORMS **c61**
Leonard A. Hermens and Jeffrey C. Schlimmer *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 268-275 (For primary document see N94-34019 10-99)
(Grant NSF-92-1290)
Avail: CASI HC A02/MF A04

Forms of all types are used in businesses and government agencies, and most of them are filled in by hand. Yet much time and effort has been expended to automate form-filling by programming specific systems or computers. The high cost of programmers and other resources prohibits many organizations from benefiting from efficient office automation. A learning apprentice can be used for such repetitious form-filling tasks. In this paper, we establish the need for learning apprentices, describe a framework for such a system, explain the difficulties of form-filling, and present empirical results of a form-filling system used in our department from September 1991 to April 1992. The form-filling apprentice saves up to 87 percent in keystroke effort and correctly predicts nearly 90 percent of the values on the form.
Author

N94-34056*# Texas Univ., Austin, TX. Dept. of Computer Science.
AUTOMATED KNOWLEDGE-BASE REFINEMENT **c82**
Raymond J. Mooney *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 276-283 (For primary document see N94-34019 10-99)
(Contract NCC2-629; NSF IRI-91-02926; TARP-003658114)
Avail: CASI HC A02/MF A04

Over the last several years, we have developed several systems for automatically refining incomplete and incorrect knowledge bases. These systems are given an imperfect rule base and a set of training examples and minimally modify the knowledge base to make it consistent with the examples. One of our most recent systems, FORTE, revises first-order Horn-clause knowledge bases. This system can be viewed as automatically debugging Prolog programs based on examples of correct and incorrect I/O pairs. In fact, we have already used the system to debug simple Prolog programs written by students in a programming language course. FORTE has also been used to automatically induce and revise qualitative models of several continuous dynamic devices from qualitative behavior traces. For example, it has been used to induce and revise a qualitative model of a portion of the Reaction Control System (RCS) of the NASA Space Shuttle. By fitting a correct model of this portion of the RCS to simulated qualitative data from a faulty system, FORTE was also able to correctly diagnose simple faults in this system.
Author

N94-34057*# Texas Univ., Austin, TX. Dept. of Computer Science.
IMPROVING THE EXPLANATION CAPABILITIES OF ADVISORY SYSTEMS **c82**
Bruce Porter and Art Souther *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 284-300 (For primary document see N94-34019 10-99)
(Contract F49620-93-1-0239; NSF IRI-91-20310)
Avail: CASI HC A03/MF A04

A major limitation of current advisory systems (e.g., intelligent tutoring systems and expert systems) is their restricted ability to give explanations. The goal of our research is to develop and evaluate a flexible explanation facility, one that can dynamically generate responses to questions not anticipated by the system's designers and that can tailor these responses to individual users. To achieve this flexibility, we are developing a large knowledge base, a viewpoint construction facility, and a modeling facility. In the long term we plan to build and evaluate advisory systems with flexible explanation facilities for scientists in numerous domains. In the short term, we are focusing on a single complex domain in biological science, and we are working toward two important milestones: (1) building and evaluating an advisory system with a flexible explanation facility for freshman-level students studying biology, and (2) developing general methods and tools for building similar explanation facilities in other domains.
Author

N94-34058*# Illinois Univ., Urbana, IL.
RECURSIVE HEURISTIC CLASSIFICATION Abstract Only c82
David C. Wilkins *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 301 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

The author will describe a new problem-solving approach called recursive heuristic classification, whereby a subproblem of heuristic classification is itself formulated and solved by heuristic classification. This allows the construction of more knowledge-intensive classification programs in a way that yields a clean organization. Further, standard knowledge acquisition and learning techniques for heuristic classification can be used to create, refine, and maintain the knowledge base associated with the recursively called classification expert system. The method of recursive heuristic classification was used in the Minerva blackboard shell for heuristic classification. Minerva recursively calls itself every problem-solving cycle to solve the important blackboard scheduler task, which involves assigning a desirability rating to alternative problem-solving actions. Knowing these ratings is critical to the use of an expert system as a component of a critiquing or apprenticeship tutoring system. One innovation of this research is a method called dynamic heuristic classification, which allows selection among dynamically generated classification categories instead of requiring them to be prenumerated. Author

N94-34059*# Stanford Univ., CA.
AGENT ORIENTED PROGRAMMING Abstract Only c61
Yoav Shoham *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 303 (For primary document see N94-34019 10-99)
Avail: CASI HC A01/MF A04

The goal of our research is a methodology for creating robust software in distributed and dynamic environments. The approach taken is to endow software objects with explicit information about one another, to have them interact through a commitment mechanism, and to equip them with a speech-acty communication language. System-level applications include software interoperation and compositionality. A government application of specific interest is an infrastructure for coordination among multiple planners. Daily activity applications include personal software assistants, such as programmable email, scheduling, and new group agents. Research topics include definition of mental state of agents, design of agent languages as well as interpreters for those languages, and mechanisms for coordination within agent societies such as artificial social laws and conventions.
Author

N94-34060*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PI IN THE SKY: THE ASTRONAUT SCIENCE ADVISOR ON SLS-2 c61
Lyman R. Hazelton (Massachusetts Inst. of Tech., Cambridge.), Nicolas Groleau, Richard J. Frainier, Michael M. Compton, Silvano P. Colombano, and Peter Szolovits *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 304-312 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

The Astronaut Science Advisor (ASA, also known as Principal-Investigator-in-a-Box) is an advanced engineering effort to apply expert systems technology to experiment monitoring and control. Its goal is to increase the scientific value of information returned from experiments on manned space missions. The first in-space test of the system will be in conjunction with Professor Larry Young's (MIT) vestibulo-ocular 'Rotating Dome' experiment on the Spacelab Life Sciences 2 mission (STS-58) in the Fall of 1993. In a cost-saving effort, off-the-shelf equipment was employed wherever possible. Several modifications were necessary in order to make the system flight-worthy. The software consists of three interlocking modules. A real-time data acquisition system digitizes and stores all experiment data and then characterizes the signals in symbolic form; a rule-based expert system uses the symbolic signal characteristics to make decisions concerning the experiment; and a highly graphic user interface requiring a minimum of user intervention presents information to the astronaut operator. Much has been learned about the design of software and user interfaces for interactive computing in space. In addition, we gained a great deal of knowledge about building relatively inexpensive hardware and software for use in space. New technologies are being assessed to make the system a much more powerful ally in future scientific research in space and on the ground. Author

N94-34061*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ENGINEERING DESIGN KNOWLEDGE RECYCLING IN NEAR-REAL-TIME c82
Larry Leifer (Stanford Univ., CA.), Vinod Baya (Stanford Univ., CA.), George Toye (Stanford Univ., CA.), Catherine Baudin, and Jody Gevins Underwood *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 313-320 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

It is hypothesized that the capture and reuse of machine readable design records is cost beneficial. This informal engineering notebook design knowledge can be used to model the artifact and the design process. Design rationale is, in part, preserved and available for examination. Redesign cycle time is significantly reduced (Baya et al, 1992). These factors contribute to making it less costly to capture and reuse knowledge than to recreate comparable knowledge (current practice). To test the hypothesis, we have focused on validation of the concept and tools in two 'real design' projects this past year: (1) a short (8 month) turnaround project for NASA life science bioreactor researchers was done by a team of three mechanical engineering graduate students at Stanford University (in a class, ME210abc 'Mechatronic Systems Design and Methodology' taught by one of the authors, Leifer); and (2) a long range (8 to 20 year) international consortium project for NASA's Space Science program (STEP: satellite test of the equivalence principle). Design knowledge capture was supported this year by assigning the use of a Team-Design PowerBook. Design records were cataloged in near-real time. These records were used to qualitatively model the artifact design as it evolved. Dedal, an 'intelligent librarian' developed at NASA-ARC, was used to navigate and retrieve captured knowledge for reuse. Author

N94-34062*# Rutgers Univ., New Brunswick, NJ. Dept. of Computer Science.
A TOOLBOX AND A RECORD FOR SCIENTIFIC MODEL DEVELOPMENT c61
Thomas Ellman *In* NASA. Johnson Space Center, The Seventh Annual Workshop on Space Operations Applications and Research (SOAR 1993), Volume 1 Jan. 1994 p 321-328 (For primary document see N94-34019 10-99)
Avail: CASI HC A02/MF A04

Scientific computation can benefit from software tools that facilitate construction of computational models, control the application of models, and aid in revising models to handle new situations. Existing environments for scientific programming provide only limited means of handling these tasks. This paper describes a two pronged approach for handling these tasks: (1) designing a 'Model Development Toolbox' that includes a basic set of model constructing operations; and (2) designing a 'Model Development Record' that is automatically generated during model construction. The record is subsequently exploited by tools that control the application of scientific models and revise models to handle new situations. Our two pronged approach is motivated by our belief that the model development toolbox and record should be highly interdependent. In particular, a suitable model development record can be constructed only when models are developed using a well defined set of operations. We expect this research to facilitate rapid development of new scientific computational models, to help ensure appropriate use of such models and to facilitate sharing of such models among working computational scientists. We are testing this approach by extending SIGMA, and existing knowledge-based scientific software design tool. Author

N94-34638*# National Aeronautics and Space Administration, Washington, DC.
APOLLO: A RETROSPECTIVE ANALYSIS
Roger D. Launius Jul. 1994 113 p *Its* Monographs in Aerospace History No. 3
(NASA-TM-109853; NAS 1.15:109853) Avail: CASI HC A01/MF A01

Since the completion of Project Apollo more than twenty years ago

there have been a plethora of books, studies, reports, and articles about its origin, execution, and meaning. At the time of the twenty-fifth anniversary of the first landing, it is appropriate to reflect on the effort and its place in U.S. and NASA history. This monograph has been written as a means to this end. It presents a short narrative account of Apollo from its origin through its assessment. That is followed by a mission by mission summary of the Apollo flights and concluded by a series of key documents relative to the program reproduced in facsimile. The intent of this monograph is to provide a basic history along with primary documents that may be useful to NASA personnel and others desiring information about Apollo.
Derived from text

N94-34668*# National Aeronautics and Space Administration, Washington, DC.
AN ANNOTATED BIBLIOGRAPHY OF THE APOLLO PROGRAM
Roger D. Launius and J. D. Hunley Jul. 1994 105 p */ts* Monographs in Aerospace History No. 2
(NASA-TM-109852; NAS 1.15:109852) Avail: CASI HC A01/MF A01

The topics covered include the following: general works, the space race, decisions, Apollo technology. The topics presented include the following: general works, the space race, decisions, Apollo technology, operations, popular culture and promotion, science, astronauts, the management of the Apollo Program, and juvenile literature. CASI

N94-34677*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
JOHNSON SPACE CENTER (JSC) RESEARCH AND TECHNOLOGY Annual Report, 1993
Apr. 1993 124 p
(NASA-TM-104788; S-758; NAS 1.15:104788) Avail: CASI HC A06/MF A02

Johnson Space Center research and technology accomplishments during fiscal year 1993 are described and principle researchers and technologists are identified as contacts for further information. Each of the four sections gives a summary of overall progress in a major discipline, followed by detailed, illustrated descriptions of significant tasks. The four disciplines are Life Sciences, Human Support Technology, Solar Systems Sciences, and Space Systems Technology. The report is intended for technical and management audiences throughout the NASA and worldwide aerospace community. An index lists project titles, funding codes, and principal investigators. Author

N94-34946 National Oceanic and Atmospheric Administration, Boulder, CO. Space Environment Lab.
SPACE ENVIRONMENT LABORATORY IN REVIEW, 1993
Jan. 1994 22 p See also PB89-159602
(PB94-153004) Avail: Issuing Activity (National Technical Information Service (NTIS))

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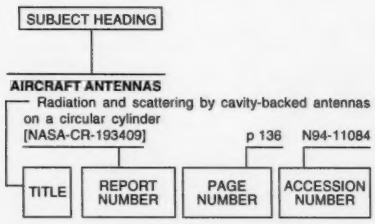

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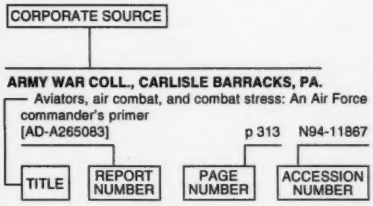

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EIA directory of electronic products, fourth quarter 1993
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ENERGY TECHNOLOGY DATA EXCHANGE, OAK RIDGE, TN.
International Energy: Subject Thesaurus, revision 1
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Proceedings SAFECOMP 1993: The 12th International Conference on Computer Safety, Reliability and Security
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JPRS report. Central Eurasia: Aviation and cosmonautics, no. 2, February 1993
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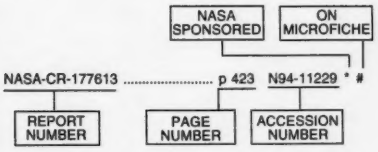

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